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ON THE

DISEASES OF CHILDREN

FOR PRACTITIONERS AND STUDENTS

BY

WILLIAM HENRY DAY, M.D.
MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON
PHYSICIAN TO THE SAMARITAN HOSPITAL FOR WOMEN AND CHILDREN

SECOND EDITION

LONDON
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THE PHYSICIANS AND SURGEONS

OF THE

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WITH

EVERY SENTIMENT OF RESPECT AND ESTEEM

BY

THE AUTHOR

PREFACE TO SECOND EDITION

My hope that this book might be found acceptable to the profession has been more than realised. In the present edition I have made a few changes which I trust will add to its value.

10, Manchester Square;
May, 1885.

PREFACE TO FIRST EDITION

THIS volume is the outcome of private and hospital practice, extending over a lengthened period. My aim has been to make the work useful, and to rely on clinical experience rather than on theories; which, even when proved, cannot always be brought to bear on points of practical interest.

I entertain the hope that the following pages may prove useful both to the student and to the practitioner. To assist the student, I have classified each disease and its varieties, after the method sanctioned by modern pathologists. To help the practitioner, I have carefully placed a descriptive heading before each chapter, to enable him to obtain readily the information he requires.

In arranging the list of prescriptions, concentration has been my aim. Certain broad principles are kept in view, as regards dose and combination, but the details can be varied at the discretion of the practitioner, according to the peculiarities of each case as met with in practice. I have invariably prescribed remedies in safe doses. Some medicines will be taken by children in large proportions and a cure effected when small doses fail. Thus belladonna will cure incontinence of urine, and relieve whooping-cough, when its physiological effects are fully produced. Arsenic will cure chorea in large doses, whilst it will frequently fail in small doses. Opium requires to be given with caution. Calomel, iron, ipecacuanha, and free purgatives are well borne by children, while strychnia and prussic acid require care in exhibition.

I have to thank my colleagues at the Samaritan Hospital for the opportunities they have given me of watching interesting cases under their care, and of giving me many valuable hints. I have especially to thank Mr. Alban Doran for the assistance he has rendered me in the chapters on Invagination and Intussusception, and on other questions of surgical interest.

My warmest thanks are due to Dr. Milner Fothergill for much information and suggestion.

I have laid myself under great obligation to the writers of standard works, and if I have failed anywhere to acknowledge the debt, the omission has been purely accidental and unintentional.

To the Transactions of the Royal Medical and Chirurgical Society, of the Pathological Society, and of the Clinical Society, as well as to the works of Jones and Sieveking, and Wilks and Moxon, I am greatly indebted.

10, MANCHESTER SQUARE;
April, 1881.

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DISEASES OF CHILDREN

CHAPTER I

INTRODUCTORY REMARKS

The study of children's diseases—Their special characters and peculiarities—Management during growth and development—Importance of attending to the constitutional rather than to the local state—Constitutional and hereditary disease.

ALL practitioners of medicine will admit that the diseases of children should be regarded in a distinct light from like diseases of adults, where too frequently disease acts upon shattered organs and worn-out tissues. The remarkable peculiarities which disease assumes in children, the course it follows, and the rapid transition from a state of danger to recovery, make this study very important.

Often obscure and difficult of detection, these diseases quickly attain force and intensity, and run on uncontrolled by any measures within our reach. It may be they have slumbered for a variable time in the system, occasioning little, if any disturbance to the general health that could be looked upon as positively foreboding evil to come; or it may be, from causes not readily discoverable, they have a sudden and fierce origin.

A life of physical activity when the renovation of the tissues is most vigorously proceeding makes great calls on the digestive functions, and these again, for the maintenance of their integrity, depend on sleep and repose when weariness sets in. Excessive mental exertion interferes with the growth of the body. The two cannot be actively carried on with impunity at the same time; the one is peculiar to childhood, the other comes naturally with the approach of maturity, and increases with the love of sedentary habits. When the organic processes are most active they are most easily upset, or hindered in their course, and in this respect alone they differ as much from similar functions in the adult as a thriving shrub does from a full-grown tree.

The children of the present day are reared differently, taught differently, and fed differently from those of half a century ago; and as a consequence the power of disease is greatly modified by such changes. If the diseases of early life are overlooked, or ill understood, the seeds of mischief take deep root, and a degenerate maturity is encouraged. A large number of the children of the poor in London grow up to be tuberculous, and ultimately die of pulmonary phthisis, from disregard of their earlier illnesses on the part of their parents. Small children, imperfectly recovered from the eruptive fevers, are allowed to run about in the streets, almost before the rash has disappeared, and the lung affection which so constantly attends measles is permitted to go on without any treatment at all. Suppurating cervical glands, otorrhœa ending in cerebral disease, dropsy, ophthalmia, &c., all follow in the rear of neglect and starvation. The functions of childhood are remarkable for change, development and activity; the skin is sensitive to all external influences, diarrhœa and vomiting are easily provoked, and the nervous system is very impressible. Hence an amount of cold or heat which would not affect a grown-up person would be fatal to a young child, for in proportion to the rapid changes which are going on there is a proportionate degree of risk. Disorder in one part is enough to disturb the whole machinery, and slight mischief having been set up in an unimportant part may rapidly extend its influence to another distant and vital part.

We have much to learn then, during the period of growth, change, and development. In a great measure children must be managed according to the strength with which they enter into the world. Some are born weak and fragile, and require the most delicate attentions to rear them through this stage. If the same measures are adopted as with stronger children they would either die, or grow up miserably wretched or unhealthy.

Mental development depends to a great extent on bodily development, and stature is regarded as a safer guide than age. For the first five years, Mr Charles Roberts observes that the body-growth of both sexes is most rapid, and runs nearly parallel; from five to ten years, boys grow more rapidly than girls; from ten to fifteen, girls grow more rapidly than boys; after fifteen, they grow slowly, and complete their full stature at twenty or twenty-one; from fifteen to twenty, boys again take the lead; they grow rapidly at first, then gradually slower, and complete their growth about the twenty-third year.[*]

The physical averages of factory children are as poor a standard of measurement as their mental averages are a criterion of brain capacity. It seems unnecessary to explain that syphilis, struma and drink on the one hand; bad food, clothing, housing and premature excessive bodily labour on the other; tend to stunt the growth of the working classes. An average of the weight and height of factory children is no standard for those more favorably situated in life.

Dr Boulton has arrived at the following conclusions:

"Healthy children grow at the following rate per annum—

Slow growing	2	inches a year.
Average	2½	„ a year.
Fast growing	3	„ a year.

A child that grows 2 inches a year will be a short adult, 2½ inches a medium, and 3 inches a tall adult. Weight should increase regularly with height, and there is no more certain forerunner of disease or unhealthy development than discrepancy in the weight for height ratio. Growth should proceed regularly and evenly, not by fits and starts. Delicate children grow most irregularly. Illness in a great measure checks their development, during which time they lose ground, that either is never made up, or only by a bound which sadly taxes the strength."[†]

It is most important that we should have some standard to go by, and this is supplied us in the table of averages which Dr Boulton has drawn up as the result of very numerous observations of his own amongst the children of healthy well-to-do people. He particularly mentions that his endeavour has been to exclude all dwarfs, giants, and evidently diseased and unhealthy children, which so seriously alter the averages of other observers, and believes that he has thus prepared a scale which may be regarded as a standard for children brought up under favorable conditions.

---

[*] "On Education and Body Growth," 'Journal of Education,' Dec. 1, 1883, p. 417.

[†] "Some Anthropometrical Observations," Harveian Society, March 1880.

TABLE OF AVERAGES.

HEIGHT.		WEIGHT.	
Feet.	Inches.	Stone.	lbs.
3	0	2	8
3	1	2	10
3	2	2	12
3	3	3	0
3	4	3	2
3	5	3	4
3	6	3	6
3	7	3	8
3	8	3	10
3	9	3	12
3	10	4	0
3	11	4	2
4	0	4	4
4	1	4	6½
4	2	4	9
4	3	4	11½
4	4	5	0
4	5	5	2½
4	6	5	5
4	7	5	7½
4	8	5	10
4	9	5	12½
4	10	6	1
4	11	6	3½
5	0	6	6

The first year of infant life is especially perilous from defective nutrition and want of proper care.[*] We are assured of this from the fact that the mortality is so much greater among the children of the poor than among those of the rich; in the manufacturing districts of the north, and in overcrowded dwellings, than in rural districts, where the mothers go to field work, and where three or four families are not compelled to reside in one small house. It is a mystery that children can be reared at all in some of our great cities and towns, on account of the impurity of the air they breathe, and the insanitary condition of the hovels they inhabit. Better accommodation must be provided for the poor if we would lessen the waste of infant life and the spread of zymotic diseases—a spread accelerated, no doubt, in these days by the rapid intercourse between one country and another.

There are few diseases occurring in later life that require so much sagacity to detect as the various disorders and ailments of young children, or so much discrimination, tact and judgment in the successful management of them. I have elsewhere stated that constitutional symptoms always demand a large share of attention, and that we have often erred when we have trusted too exclusively to physical and local signs. At all ages and in both sexes, it is my belief that we are never likely to be so successful in controlling disease as when we mainly direct our treatment to the constitutional state.* This does not imply carelessness of, or indifference to, physical signs. In children the constitutional state should never be forgotten, for many a sound practitioner has lost his little patient whilst watching the pulse closely and listening with care to the respiration, when he might have saved life by leaving these symptoms to take care of themselves and looking to the general state as the sure index of danger. Neither the pulse, the skin, nor any light which auscultation and percussion afford, are such valuable signs of disease in children as they are in adults. Constitutional diseases are the consequences of impairment in the processes of nutrition and secretion. In children they are more frequently hereditary than acquired. A child is born with a predisposition to some particular disease, as tubercle, cancer, gout, &c.; but if the life it leads is conducive to sound health, the morbid tendency may never show itself. And this may afford an explanation of a constitutional and hereditary disease skipping one generation and appearing in the next.

---

[*] It is stated on the authority of M. Kuborn, of Belgium, that the mortality for this period of life in the principal countries of Europe is as follows:—"Out of 1000 children, there die in Sweden 153, in Denmark 136, in Scotland 156, in England 170, in Belgium 186, in Holland 211, in France 216, in Prussia 220, in Spain 226, in Switzerland 252, in Italy 254, in Austria 303, in Russia 311, and in Bavaria 372."—*British Medical Journal*, Jan. 27th, 1877, p. 113.

We cannot, in many complaints, so easily determine the extent and degree of local mischief in children as we can in adults; and even where we are pretty certain, we shall find it an admirable rule to trust to the general condition of these young patients, rather than to rely on the uncertain knowledge which doubtful local signs often create in our minds. It is often quite impossible to depend upon the testimony of children as to the seat of pain or suffering, and the medical attendant requires to exercise very great discretion and judgment before he draws any conclusion. Let the abdomen of a child be lightly pressed, and it will almost always, when interrogated, reply that it feels pain. In a case of fever it may be very important to be safe on this point, as I have seen leeches and counter-irritants applied when the local signs of pain or congestion, or inflammation have not existed. The tumid and protuberant abdomen of a child is sometimes looked upon as an indication of disease, when it is in all respects healthy and natural.

Disease is early and easily implanted by the parents of children who set at defiance those natural laws upon the observance of which health and strength depend. A young child, like a young plant, requires suitable nourishment and judicious feeding. Those children are the healthiest and strongest in every way who are allowed certain freedom in their amusements and out-door exercises. The over-fond and timid parent shuts up her child in one temperature to protect him from cold and damp, and this often to the ruin of his general health, because it is impossible to provide against the variability of temperature in this climate. Very young children should be kept warm, and yet not strangled with tight clothing. Plenty of pure air is most essential for health. When the weather is fine, they ought to be sent out in the air every day, and the windows of their nurseries and sleeping rooms should be opened twice daily. In a climate like that of England, however, where we have seldom two days alike, great prudence is required before exposing children to any risk of cold, as the respiratory tract is so sensitive in early life. Cold alone will originate other evils; the mucous membrane of the stomach and bowels will also suffer, and delicate health becomes established, from which the child either sinks, or very slowly recovers. When infants are taken out of doors a nurse's arms are preferable to a perambulator, on account of the warmth she imparts to them.

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* *Vide* a paper by the author "On the Relative Value of Symptoms in the Diagnosis and Treatment of Disease," 'Transactions of the St. And. Med. Grad. Association,' vol. ii, p. 78, 1869.

If we consider the way in which the children of the poor are brought up in the country, we may learn a lesson from it. When born of healthy parents, they endure with impunity the trying changes of our climate, and resist diseases to which their poorer brethren in large towns and overcrowded dwellings would quickly succumb.[*] In the middle and upper ranks of life children are often injudiciously fed; their meals are increased in richness and frequency, when they should be of the plainest kind and moderate in quantity. When a child refuses food, my maxim is always to let it alone for a time. The appetite of a child is a good gauge of its powers of digestion, and if you force it to eat against its will the probabilities are that the food will disagree. In such cases the rule we ought to lay down for eating should be, "little and seldom," and not "little and often." The digestive organs require rest in common with the brain and the organs of locomotion; and yet as soon as derangement of them sets in, the habit is too frequently followed of administering food and medicine, by which they are kept in a perpetual state of irritation.

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[*] "Given the benefits of an out-door life in a pure atmosphere, and the child of the country peasant will thrive, and develop an abundance of blood and muscle, almost without meat at all. The children of the poorer classes in towns stand upon a very different footing, and the struma and other diseases fostered in close alleys are often greatly aggravated by the effects of an insufficient diet."—*The Lancet*, Editor's Remarks, April 20th, 1872, p. 550.

Unless marked indications exist, the pernicious practice of flying to tonics, alteratives, and aperients as the case may be, is objectionable. Medicines should be avoided when possible, it being far better to trust to food than to physic. Convulsions, marasmus, abdominal and thoracic affections, are constantly to be ascribed to improper and insufficient food.

Parents and nurses seem unmindful of the necessity for adapting the diet to the age and strength of the child, by which they cause much unnecessary suffering, and frequently invite disease. Indigestion, that prevalent source of subsequent evil, is brought about in a great many cases by feeding young children with farinaceous food and different kinds of biscuits, which undergo fermentation, and produce distressing flatulence and disorder of the stomach and bowels. Such diet, in the absence of milk, is obviously unfit for the purpose of growth and nutrition, indigestion sets in, and the child's hunger seems never appeased; the liver is said not to act, medicine is given, and there is an aggravation of the evil. It loses flesh, and is crying and whining during the day, till the bowels start off, producing temporary ease. There is the same restlessness and discomfort at night. The extremities become wasted, and the skin hangs in loose folds; the bowels are irregular, and the stools are vitiated; sometimes there is constipation, and sometimes diarrhœa, and many children succumb before they reach the age of one year, owing in a great many cases to the manner in which they are fed.

CHAPTER II

MILK DIET AND HYGIENE

Composition of milk—Condensed milk, its properties and value—Use of Milk in disease and constitutional weakness—Farinaceous foods—Dentition—Choice of a nurse—Constipation—Scotch oatmeal—Stimulants—Air, exercise and sleep—Cold bathing—Aperient medicines, their uses and abuses—Preparations of iron—Antimony—Sedatives—Opium—Bromide of potassium—Hydrate of chloral—General conclusions.

MILK contains all the necessary ingredients for the preservation of health, and at no period of life is it so valuable as during that of growth, when the functions of assimilation and digestion are most active. The rapid increase of growth in all the tissues, and the waste that also hourly goes on, demand that nourishment should be supplied at short intervals. We thus introduce into the stomach a fluid which does not tax the tender membrane in its work of absorption, and rare are the instances in which it is not tolerated.

The composition of milk is variable both in quantity and quality, according to the animal which furnishes it and the state of that animal's health at the time. It varies according to the amount and quality of the food, the time at which it is drawn, and a number of other circumstances. For instance, pasture-fed cows yield an alkaline milk, whereas the milk of the stall-fed is more or less acid, and therefore less digestible for infants. The principal ingredients in milk are casein, sugar, fat, and salts. So long as the carnivora live on a purely animal diet no sugar can be detected in the milk, but when the diet is mixed, as it is in the human species and amongst different herbivorous animals, sugar appears, and all the different ingredients undergo great variation.

Woman's milk is rich in milk-sugar and fat, but poor in casein.*

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* 'La Presse Medicale' says "that the researches of Dr Condereau, of Paris, show that the milk of Esquimaux women contains a small proportion of salts, but is rich in

Mare's milk is poor in casein and fat, but extremely rich in milk-sugar. Ass's milk contains a much larger quantity of milk-sugar and salts than that of woman's, but more water and less casein and butter. Vernois and Becquerel estimate the casein of ass's milk at 35·65 per 1000, and the butter at 18·50; the casein in human milk at 39·24, and the butter at 34·61. After mare's milk, sheep's milk contains the most solids, then cow's, then goat's, then woman's. According to some authorities the casein is a combination of albumen and potash. The great difference between albumen and casein consists in this, that the latter is not coagulated by heat, which precipitates the former. Casein is coagulated by acetic acid, which is not the case with albumen. Casein seems to have also the power of combining with the phosphates of lime and magnesia, and rendering them soluble. The saline matter of milk, which is nearly the same as that of the blood, is largest in cow's and goat's milk; it seldom exceeds one per cent., and in poor milk it may be considerably lower. Cows fed on beet-root and carrot augment the sugar; the race of Alderneys are said to give more fat, and the long-horns more casein.

In the milk of the cow, goat, and sheep, the proportions of casein, butter and sugar, are nearly the same, varying from three to five per cent. Milk, then, contains three classes of organic constituents; the albuminous, the saccharine, and the oleaginous, with those mineral ingredients so necessary for the consolidation and development of the infant fabric. In the human female the saccharine and oleaginous elements are present in large amount, but they are affected by the kind of food which is taken and the amount of out-door exercise. Exercise is said to favour the secretion of casein, and the cattle which feed in exposed situations, and have to take great muscular exercise to procure their food, as in Switzerland and some other mountainous and barren districts, yield only a small quantity of butter, but a larger proportion of cheese. The very opposite takes place, according to Carpenter, when the same cattle are stall-fed.

Unless milk is perfectly fresh and reliable, it is very prone to undergo lactic acid fermentation, and thus, in becoming sour, a fungoid growth is developed which is highly detrimental to infantile assimilation. The milk so changed might not try the strong

---

sugar, and especially in fat, derived from the great amount of oily food which they consume to resist the cold in their native land."—*Medical Press and Circular*, Feb. 13, 1878, p. 142.

digestive powers of an adult, but for an infant or young child it would lay the foundation of delicacy, and invite those diseases which are so ready to attack early life. We are too well acquainted with the cramp, spasm, and indigestion, which attack children who are brought up by hand, and who take their milk out of dirty bottles. The casein undergoes decomposition, and lactic acid is formed in large quantities.

Pure cow's milk should, when placed in a tall narrow glass vessel, be opaque, and of a perfectly white colour, having no deposit, and without any peculiar smell or taste. Boiling should not change its appearance. It ought to yield from six to twelve per cent. of cream by volume. This is hastened by adding water, and the cream should rise in from four to six hours. Its specific gravity varies from 1·026 to 1·035. Some authorities give from 1·028 to 1·032, and say that if it falls below 1·026 it indicates that the milk is poor, or that water has been added. The specific gravity is therefore a most important test of the quality of milk. But it must be remembered that a large quantity of cream will lower the specific gravity, which rises again when the cream is removed. Dr. Parkes says, the average specific gravity of unskimmed milk may be taken as at 1·030 at 60° Fahr., and the range is nearly 4° above and below the mean.

In the adulteration of milk, water is most commonly used, and as I have just said, is to be detected by the specific gravity. Iodine detects the presence of starch, which, like gum and dextrin, is added to give thickness. Annatto or turmeric is added for the sake of colour. Chalk is added to give thickness and colour, and to destroy acidity. Cream is adulterated with magnesia and arrowroot. Yolk of eggs is added both to cream and milk. When milk is boiled to preserve it, it may take up from the vessels that are used, lead, copper, or zinc.

When examined by the microscope, milk is seen to consist of a number of round spherical bodies with dark margins floating in a transparent fluid. When the milk is fresh and healthy, the globules are fairly uniform in size, they roll freely over each other, and do not collect together in masses. If they do become mingled, and granular bodies of different sizes are seen, whilst a few globular bodies preserve their distinct isolation, it cannot be called good milk. Such a specimen of milk, known as colostrum, is found in the human female after parturition, and if it does not disappear on the fifth or sixth day, the milk must be considered unhealthy and unfit for the child. Of course we may find in it, pus, blood, epithelium in large amount, casts of lacteal tubes, seeds, fungi, &c.

The number of the globules determines the quality of the milk, and they are more numerous in cow's than in human milk.

The analysis of chemists differs so widely that in a work of this description it would be beyond the mark to give the results of their examinations. The practical outcome of their investigations is enough for our purpose. It is beyond dispute that cow's milk is richer than human, and it must therefore be diluted in order to make it resemble the latter. Further, it contains less sugar, and accordingly a small amount should be added to make up for its deficient sweetness.

When the milk is acid it presents just the same appearance as it does when treated with acetic acid, which causes the casein to coagulate.

Seeing that the high price of ordinary pure milk may in time place it beyond the reach of the poorer classes, it is important to inquire whether some of the forms of "condensed milk" lately introduced may not be equally nutritious, and the milk be unaltered in its qualities, when deprived of the water it contains. These results have been accomplished by Mr Gail Borden, of New York. He has invented a process for converting milk into a solid, which can be kept pure for a long period, and then by the addition of water be brought back again to its original flavour and consistency. About three fourths of the water are removed, so that the milk is in a semi-liquid state, of the consistency of honey. Mr Borden believes that neither "desiccated," powdered, nor "solidified" milk can be preserved for any length of time. They require hot water to dissolve them, whilst the condensed milk prepared by Mr Borden will dissolve at once in cold water.

The condensed milk now known to the public has undergone no change except the removal of the water and the addition of sugar. One pound of the "condensed milk" is equivalent to three or four pounds of the crude milk. It is roughly estimated that about eight million five hundred thousand pounds are manufactured annually in the eight or ten factories in the United States, or five hundred cases of four dozen one-pound cans daily.

According to Mr Willard, dirty milk, milk foul with the drippings of the stable, cannot be condensed into a clean flavoured product. To be so prepared it must be uniformly good. He proceeds to make some interesting observations on the causes that change milk into an unhealthy condition, and alludes to the well-known researches of Hallier and Pasteur, who consider that this change is brought about by the presence of living organisms in the atmosphere, of germs from cesspools and putrid animal matter, that are absorbed by the milk in which they grow and multiply. He alludes to the fungi theory, and quotes the words of Professor Caldwell on the deleterious effects the micrococcus, the cryptococcus, and the penicillium exert on milk, which is peculiarly susceptible to emanations from decomposing and putrid matter. He points out that the germs floating about in the atmosphere, if inhaled by the cows, will infect the milk before it leaves the udder. He cites the statement of Mr Foster, of Oneida, that cows inhaling emanations from putrid, decaying matter, yield milk unfit for making cheese. He mentions instances of the milk being tainted from cows passing through sloughs of decomposing vegetable matter. Particles of dirt adhering to the udder, and finally falling into the milk during milking, introduce germs which cause it to decompose and putrefy.[*] Perhaps the most important point is that noticed by Professor Low, of Cornell University. He observed in the hot weather a peculiar ropy appearance in the cream which had risen on the milk. Under a powerful microscope it was found to be filled with living organisms, and he traced this condition to the cows having slaked their thirst from a stagnant pool for lack of clear running water. This water was examined microscopically and found to contain the same class of organisms. The blood of the cows also yielded the same results. He then obtained a specimen of pure and good milk, and put into it a drop of water from the stagnant pool, and in a short time an infinite number of these tiny organisms became developed in the milk. The cows were hot and feverish, as indicated by the thermometer.

The exact way in which this impurity of milk mentioned by Professor Low was brought about does not materially affect the question at issue. Whether it depends on M. Pasteur's vital or germ theory of fermentation, or on the physical theory which supports the view that communicable diseases are owing to organic poisons neither independently reproductive nor indestructible, is of no moment.

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[*] "Infusoria are sometimes found in milk, and fungi (oidium lactis and penicillium) are so almost invariably if the milk has been kept."—Dr Parkes, 'Practical Hygiene,' p. 244, 4th edition.

For some most important observations on the changes in sour milk, see Professor Lister's Introductory Address, delivered at King's College, October, 1877.

Whether the atmosphere contains living germs that induce putrefaction, or particles of dead organic matter which incite putrefaction, does not lessen the danger that milk consumers are exposed to.* Few questions can be of more vital importance to the community at large, than that which establishes the fact of the milk of the cows being rendered poisonous or injurious through the water they drink, or the food they eat.

Very little difference appears to exist between the composition of the condensed milk of the English Company and that of the Anglo-Swiss Company. There is indeed a great resemblance between them in every respect.

CONSTITUENTS OF CONDENSED MILK.

	ENGLISH COMPANY.	ANGLO-SWISS COMPANY.
Water	26·1 to 29·0	25·3 to 27·1
Butter	9·2 „ 19·7	9·1 „ 10·4
Casein (including albumen)	11·4 „ 12·8	10·9 „ 13·0
Sugar of milk	13·1 „ 14·3	14·0 „ 14·7
Cane sugar	35·3 „ 38·1	36·1 „ 39·0
Mineral matter	2·1 „ 2·4	2·0 „ 2·4

Mr Bartlett, in his paper on "Condensed Milk,"† from which I have borrowed this analysis, says that all the samples of condensed milk are remarkable for their freshness, and that although some were open for a fortnight in damp and warm weather, no trace of milk fungus could be detected. The best dairy milk, exposed for twelve or fifteen hours, became filled with myriads of elongated bodies or fungus spores, from which the condensed milk is preserved, doubtless by the moderate but sufficient heat incident upon condensing.

To sum up—the chances of lactic acid fermentation are reduced in condensed milk, and this milk replaces human mother's milk better than that of the ordinary stall-fed cows of large towns, which is often, in addition to its natural unfitness for infant's food, weakened by admixture with water, and rendered unwholesome by adulteration. Several instances have been brought under my immediate observation.

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* See the 'Journal of the Royal Agricultural Society of England,' 1872, vol. xv, p. 103, from which many of the foregoing observations are gathered. 'The American Milk Condensing Factories and Condensed Milk Manufactories,' by X. A. Willard, A.M., of Hermiker, New York.

† 'Journal of Public Health,' October 15th, 1873, p. 187.

Some patients tell me that their children never throve until they gave them Swiss milk, and the same testimony is repeatedly given by hospital out-patients. Under its use the secretions are kept regular and in good order; the unhealthy, slimy, and dark offensive motions of young children are not nearly so common. I cannot say that there is any real difference in the nutritive or digestive properties of Aylesbury over Swiss milk, but the latter is considered by some medical men to suit better than the former, and, so far as my observations go, Swiss milk is the most widely known. Swiss milk contains rather less casein and rather more sugar, which may make it more digestible and likely to keep longer. The great advantages of these condensed forms of milk are that they undergo few changes, and are unvarying in their qualities. They are particularly adapted, too, for hot weather, when cow's milk readily undergoes putrefactive change and causes sickness and diarrhœa. Cases are to be met with, however, in which cow's milk suits best, and after children have passed the age of three months they do not thrive so well on the condensed forms of milk. This is partly to be explained on the ground that when cow's milk is employed we dilute it with water, and add sugar for the first two or three months, but we gradually withdraw the sugar and give the milk undiluted.

Many families are in the habit of receiving their milk in deep jugs with narrow tops, and keeping it in small and confined larders, where it is liable to be impregnated with the effluvia of game, fish, &c. This odour has not the same chance of escape as when the milk is poured into shallow, broad vessels, where it can be kept cooler, with a large evaporating surface.

Milk is an organic fluid quickly liable to putrefaction and fermentation, and to become tainted and undergo change of taste and odour when left in the vicinity of cheese, tainted meat, and some kinds of fruit. Poisons are conveyed through the medium of the atmosphere, or through water, and it is no longer a disputed question that milk also may be a disseminator of disease. It can absorb deleterious effluvia, under the circumstances just alluded to, and become unfit for human consumption. When we remember how quickly in hot weather, milk undergoes putrefaction and fermentation, losing its sweetness and becoming rancid, in the course of a few hours, we have the clearest proof that organic poisons may readily become absorbed by it. Either by air or by water the poison of zymotic diseases is conveyed, and those persons engaged in milking, who have recently attended on the sick, may even propagate the disease by their hands or by their clothes.

Our experience of the milk epidemic of typhoid fever, in 1873, opens our eyes still further on another point. The poison of cholera finding its way into water, may be spread through milk in the same manner as typhoid; and the atmosphere becoming contaminated with the poisons of scarlet fever and measles, may be absorbed by the milk.

The milk of diseased cows decomposes quickly, and instead of the round oil globules, which are the only constituents of healthy milk, colostrum with granular masses, and a large amount of epithelium, are to be seen under the microscope. Casts of the lacteal tubes may also be sometimes detected. It must appear self-evident that few points can be of greater practical importance than to ascertain the chemical and microscopical characters of milk in all cases where sick children are living chiefly on it.

I now come to consider, and that very briefly, what are the diseases in which milk is especially indicated as a medicine. As a diet we recognise its value, and assign to it the first position among all kinds of food. To bring up children healthy and strong milk in some one of the forms I have alluded to must be provided liberally. Constitutional weakness in children is greatly developed by scanty and impure milk; hence we have great mortality before the age of one year is reached. In some of our large manufacturing towns, as Manchester, Liverpool, Glasgow, &c., the mortality of infant life is appalling. Regarding infant mortality, Dr. Carpenter, of Croydon, says that "ninety per cent. of the children which are put out to dry nurse by wet nurses, die after a few weeks of hand-feeding. This mortality is induced by the administration of improper food. It is shown by the Registrar-General's statistics that more than 20,000 children, under one year of age, die in England every year from convulsions; that is *one* out of every 34 dies within the year, whilst in Scotland *one* only in 370 dies from such a cause. The great difference between English and Scotch feeding among the poor is the cause of this variation; the northern babies are not stuffed with farinaceous food before they are able to digest it; Scotch mothers scarcely ever feed their babies with anything else than that provided by themselves in the first few months of their lives, and the result is, that convulsions as a cause of death, are comparatively rare in the first year."*

We know that in some children, and even in adults, the digestive functions are so enfeebled that milk cannot be assimilated. The occasional aversion to milk is also well-known, and the dislike to it cannot be overcome. I saw one child, six months old, who could digest about half a pint of milk daily, but if this quantity was increased severe sickness followed, and the attempt to give more with lime water or plain water, or Dinneford's solution of magnesia, was of no avail. It was impossible to give it in any large quantity, and the diet was supplemented by veal broth, chicken broth or weak beef-tea. In some adults severe discomfort, weight and indigestion, follow from the continued employment of milk, and it cannot be denied that ordinary cow's milk does tax or interfere with the digestive power in some cases if taken in any considerable quantity long together. It causes weight and heaviness, and in some cases constipation, and where this is so, aversion or dislike is certain to ensue. Brandy, soda-water, lime-water, dill-water, &c., have been employed to overcome this objection, and in a great many instances the addition has been successful, and the coagulation or curding in the stomach has been prevented.

In all those diseases that are of a consumptive or wasting character, and where emaciation is going on, milk is extremely valuable, suitable to the digestive organs, containing all desirable elements for the repair of the body, and best compensating for its waste.

In acute diseases of the febrile class, and nervous diseases generally, milk is a powerful restorative. In the diarrhœa of enteric fever and some other profuse discharges, hæmorrhages and loss of blood, and great lactation, we have in milk a valuable remedy. By increasing the general nutrition it has the effect of diminishing the discharges from the mucous surfaces.

Among children of well-to-do parents, and in the higher ranks of life, I have repeatedly seen the advantage of giving them a good supply of milk before going to bed and on getting up. The appetite has improved, and each meal has been relished and digested through the milk, which has acted as a tonic. These facts are, however, known to all of us, and similar instances occur in our practice every day.

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* "Some of the Causes which produce Infant Mortality and Constitutional Weakness," by Alfred Carpenter, M.D., 'Public Health Journal,' June, 1873.

This brings me to say that milk is constantly underrated by parents and mothers, and credit is given to certain patented "corn-flours" to which they are not entitled. We may lay it down as a golden rule that unless food is easy of digestion it fails to be nutritive. Many of the forms of food advertised for children are said to contain a large percentage of earthy phosphates, and to be singularly rich in nitrogenous or plastic materials. They may be of service where milk is also freely supplied, but without it they are of questionable value, as they contain a large proportion of starch, which young infants are incapable of digesting. The salivary and pancreatic glands do not reach their functional development until the infant has attained the age of eight or nine months; and as starch requires to be acted upon by their secretions before it becomes converted into a soluble sugar, it follows that all farinaceous foods are incapable of digestion, and therefore worse than useless before that age is reached. The true function of the saliva is to convert starch into glucose or sugar, and unless it is so acted on by the salivary or pancreatic secretions, it either passes through the bowels unchanged or undergoes lactic acid fermentation, producing flatulence and spasm by the quantity of intestinal gases which are generated as a consequence.[*][†]

Many children perish the first year of their existence from failure of the digestive organs, and when underfed they quickly succumb to any acute disease. A farinaceous diet may make children plump and fat for a time, but if long continued, or enough milk is not given, the blood becomes thin and deficient in its solid constituents, and exhaustion, and even fatal syncope, not unfrequently follow. At the present day farinaceous foods, as corn-flour, arrowroot, sago, &c., are altogether condemned by many persons as unfit for nutrition, but in combination with milk some preparations have seemed to me palateable, digestible, and non-irritating, and they have satisfied the appetite and craving for food when milk alone has failed.

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[*] "Some Experiments on the Digestibility of Starch by Infants," 'Journal of Public Health,' August, 1872, p. 111.

[†] See Chap. XII, "On Indigestion."

It is important to allude to this fact of salivary secretion in infantile life, "For the first few months it appears that no saliva at all is secreted; and it is true under natural circumstances, from the character of the food, and the absence of masticatory organs, that it is not required."—Pavy, *On Food and Dietetics*, 1875, p. 527.

"The digestion of starch is accomplished by the saliva and pancreatic juice, both of which are rich in diastase. Diastase also exists abundantly in the liver, and in smaller quantities in the intestinal juice, in the blood, the urine, and apparently in all the intestinal juices. Diastase from all these diverse sources appears to act substantially in the same manner on starch, changing it by a progressive hydrolysis into sugar and dextrine."—*Lumleian Lectures on the Digestive Ferments*, by W. Roberts, M.D., F.R.S., April, 1880.

In very young children, however, milk is the only nourishment required, so nicely adjusted are its component parts, but until we can convince mothers and nurses that a child can grow and thrive on it, we must expect the substitution or admixture of other foods. Sometimes we are told the milk does not agree, and on inquiry we find that either the nurse or the mother, if suckling, is out of health, and the milk as a consequence is defective and ill-suited to nourish and sustain the child. Every mother should know the importance of weaning her child at seven or eight months, because suckling beyond this time is likely to damage the health of both. If the mother can nurse her child so much the better. If delicate she should not suckle during the night, as it will disturb her rest and exhaust her. When, however, the mother's milk is scanty, she should not attempt to nourish the child entirely, but give warm milk-and-water out of a bottle. If she cannot suckle it, it should have equal parts of milk and water, and it is a good plan to boil it before putting it into the bottle. Let it be sweetened with half a teaspoonful of sugar, and see that the tube and bottle are well rinsed out, and kept perfectly clean. It is a bad plan to overfeed a child at one time: the sixth part of a pint of milk and water is enough for a meal, if the child is under a month old. If the milk disagrees, a tablespoonful of lime-water, or sometimes the same quantity of dill-water, may be advantageously added to each bottleful. Regular feeding is of great importance; till the child is two months old, once in two hours will be often enough, and afterwards once in three hours; of course if the child is very delicate, it may require to be fed oftener, but it is an error to put it to the breast every time it cries.

In treating the ailments of suckling children, we ought to examine the milk of a wet-nurse very closely, for any error in diet on her part, or any indiscretion in drinking, will be certain to be felt by the child she is bringing up; mere emotion, anger or disappointment will influence the lacteal secretion. Attacks of cramp, spasm, flatulence, emaciation, and diarrhœa in young children can constantly be traced to dyspepsia brought on by the milk, or the mental condition of the nurse, and all the medicines we may prescribe will prove but palliatives so long as this state of things is suffered to go on.' In selecting a wet-nurse it is very important that she should be in good health and spirits, and free from constitutional taint. She should be fully grown, and as a rule, not less than twenty-two years of age. Leucorrhœa is an objection, and any evidences of strumous disease, as scars in the neck; then the most rigid inquiry should be instituted as to whether she be free even from the suspicion of syphilitic disease. The evidence of syphilis is somewhat difficult to find in the absence of any active manifestations, but it is always well to search for maculæ and ulceration about the fauces.

Instances are repeatedly met with where constipation is the chief symptom. The child's bowels act once in two or three days whilst the appetite is good, and the condition is in every other respect healthy. The motions are deficient in moisture, and painful to pass through the anus, which becomes red and tender. The little sufferer screams in its straining efforts to evacuate the impacted mass. This nursery trouble may set in soon after birth, and add to the risk of teething. The liver in these cases does not act well, and the small intestines fail to furnish their due amount of secretion, and the rest of the intestinal tube becomes sluggishly passive in propelling its contents. Over-feeding causes this troublesome constipation as often as under-feeding induces diarrhœa and exhaustion. But the cause is not always ascertainable. In some cases I have been inclined to regard it as constitutional. It occurs occasionally where the mother's milk is healthy, and microscopically faultless.

The mother may be weak and languid, notwitstanding the good character of her milk, and if her health is not attended to the milk will become impoverished, and the child suffer in other ways. Mere constipation in the child, is no evidence that the milk is at fault, but when given too frequently and abundantly it deranges the hepatic functions. In these cases of otherwise healthy children a saline aperient given at bedtime, and repeated early in the morning is a good remedy.* After a few doses the bowels begin to act more regularly, and the motions become soft. In alternation with the mixture the soap enema is an excellent remedy. As the nurse sits with the child in her lap before a fire, friction with the hand for a short time, morning and evening, over the abdomen acts as a capital stimulant to sluggish bowels. We now and then meet with another class of cases in which the motions are moist and of proper colour, but considerably larger and firmer in consistence than we expect to find in infants of five or six months old. The bowels will not act without an enema, or an aperient of some kind, and parents become alarmed if this goes on, as it often will in spite of any treatment, till dentition sets in. When there is no mechanical obstacle as hernia, imperforate rectum, or invagination, the fault may in most instances be attributed to the food. If the general health of the child should keep good, no harm will follow from this form of constipation. The aperient must be varied from time to time, and the enema used in change with it. When simple remedies fail, a teaspoonful of the decoct. aloes comp., or a grain or two of scammony or jalap, or even an occasional mercurial will rouse the torpid liver and inactive viscera, and promote the passage of bile and mucus. It sometimes happens that immediately a tooth penetrates the gum the symptoms improve and the constipation departs. In other cases the constipation is troublesome, and an enema has to be given every third or fourth day till the child can run about and take exercise.

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* Form. 1:
℞ Magnes. Sulph. ʒj
Tinct. Rhei ℥ss
Vel Syr. Rhei ℥ss
— Zingib. ʒij
Tinct. Cinnamomi, ʒj
Aquam Anethi ad ℥ij
— M.

One to two teaspoonfuls to be taken at bedtime and in the early morning.

For a child five or six months old.

Milk mixed with bread, as children grow older, is very excellent. For my own part, I have much faith in the familiar expression, "Bread is the staff of life;" and if we want to know its nourishing properties we have only to look at our village population. Many healthy children from the age of three months thrive on this diet, and grow up strong and healthy. Scotch oatmeal is another valuable article of diet; it is very nutritious, and regulates the action of the bowels better than anything else with which I am acquainted. It should be mixed with milk, and may be given to children from the age of one year.

Of course, differences of situation necessitate differences of treatment, and children of delicate parents, living in a vitiated atmosphere require a special diet. At seven months old the child may have milk, to which Robb's biscuits or Liebig's food may be added, or well-baked bread. The child should have plenty of warm milk in addition. At ten months old it should have weak broth or beef tea. When a year and a half old it may have pounded meat, with a little gravy, or meat cut up very fine. Much will depend upon the natural strength and constitution of the child, but solid animal food should not be given till it is two years old. Hospital patients have repeatedly told me that milk alone would not satisfy the hunger of their children, and before bottles came into fashion I have often seen strong and healthy children, at four or five months old, being fed with milk thickened with bread; whereas, among the very poor in rural districts, gruel has in many instances been the only article of diet. A delicate child would break down under this system of feeding, but in those who are thriving and breathing pure air it has no prejudicial effects. Whether the child be strong or delicate, milk should be the chief article of diet till the age of two years; and the continuance of debility should be an indication to persevere with the milk pure and alone. It is a popular error among mothers that milk must soon give place to solid food, and yet those whose practice lies among children will often observe a child at eight or nine years of age, with a good appetite, eating meat three times a day, grow thin, pallid, and languid. These children have delicate digestions, the tongue is indented at the sides, the back coated with a whitish fur, and there are superficial abrasions of the mucous membrane, all indicating extreme feebleness of digestive power, amounting to slow starvation.* Place such a child on a diet of milk and he begins to thrive at once: his tongue gradually improves, his bowels are regular, and he gains flesh and strength with surprising rapidity. If you can induce the parents of such a child to give him a basinful of milk-and-bread for breakfast instead of tea, and let him have well-minced mutton or chicken once a day, and cod-liver oil, he will throw off his delicacy, and the rest will have enabled his digestive organs to gain strength.

When children have cut their incisor teeth they are liable to feverish discomfort and restlessness; they alarm the nurse and the mother by starting in sleep and exhibiting a spasmodic movement of the lips and eyelids. If we examine the mouth in such cases we shall generally observe that the gums are red and tender, and although other teeth are not appearing nor distending the gum, they are probably at no great distance. It is always well to puncture this inflamed gum with a lancet, and to give a freely acting purge. If the child is strong enough, let it contain a grain of calomel, for, much abused as this drug is, and told as we are on evidence that seems conclusive, that it does not increase the secretion of bile, I know not where to find any purgative or alterative medicine that acts so efficiently in many of the diseases of early life. Let it be given on an empty stomach, and do not deny the child, if old enough, a drink of cold water or of toast-and-water. This is, however, at best a critical period with children, requiring much care and watchfulness on our part. The nervous system is easily affected, and the digestive functions are readily upset, which would be less likely later on. The frequency of convulsions in early life should always be borne in mind whenever the system is out of order, and the medical attendant should never lose sight of the liability to them in young children, however well a case of illness may be progressing.

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* See Chap. XII, "On Indigestion."

Health and disease hold close relationship, and we are often perplexed to know where the one ends and the other begins. Where medicines are necessary, it is very important that they should be prescribed in as agreeable a form as possible. A medical man will often get much credit by ordering his medicines pleasant to the taste; and there are very few drugs really necessary for children which cannot be given in a pleasant form. Some practitioners there are, however, who seem never to have considered this matter, and as a consequence, many of their medicines are thrown aside by the mother or the nurse, who, rather than hear the shrieks of the child, gives up the effort to administer them.

The habit of giving young children wine and beer is a very bad one; their digestive organs require no stimulants to aid the process of digestion, as is the case in after-life, when the stomach loses its tone and becomes enfeebled, and where a glass of wine is necessary before the patient can either fancy or digest his food. Some of the strongest and healthiest children I have ever seen have been those whose diet has been the plainest, and where stimulants, cheese and pastry have been ranked with objectionable nursery drugs, as grey powder, cordial mixtures, and teething powders. In illness, and especially in acute disease, where time is valuable, stimulants may be demanded; and in my own experience I have several times known young children recover from acute diseases in consequence of their administration.

There is nothing more important than air and exercise for children. When shut up in the house they become fractious and irritable, losing their colour and appetite, and becoming very wayward and difficult to manage. The natural disposition of a child may be greatly determined by being habitually shut up in a room, and deprived of proper air and exercise. In the house it soon tires of its amusements, but when carried in the open air fresh objects continually meet its eye and engage its attention; digestion is improved and healthy sleep promoted. Children who live in London and other large cities exhibit in a most remarkable degree the salutary effects of country air, and when they have been kept from falling into ill health by the tenderest and most judicious care, they revive under the influence of change with a rapidity that is truly astonishing. In densely populated places foul and impure gases are breathed into the system, and carried into the blood, which only the pure oxygen of the country can remove.

If eating a heavy meal on going to bed, or indulging in tea and coffee after a good dinner, tend in some adults to cause sleeplessness, melancholy dreams, throbbing headache, and cardiac pulsation, sending children to bed exhausted and with empty stomachs will also equally cause discomfort. Such children dream, and are restless in their uneasy sleep; they toss the clothes off, and are peevish and tired when they are roused to dress and get up in the morning. If jaded by long walks and the strain of school, interrupted digestion is indicated by fatigue, and they are sent to bed too exhausted to obtain refreshing sleep. Children should have a light meal half an hour before retiring to bed; a sandwich or a slice of bread-and-butter will in most cases suffice to satisfy the craving stomach, and allay the fainting empty feel. If food, however nutritious, is given them at this time when they are too exhausted, and the nervous force which should have been reserved for the stomach has been expended in active locomotion, we only aggravate the evil. The feeble stomach as much resents the presence of food as the weak eye resents the light. Let us bear in mind that a child requires more sleep than a grown-up person, because tissue change is much more energetic, and the organs demand more rest for their repair and growth. The digestive system, too, requires the frequent administration of suitable food, that the absorbent process with its varied chemical changes, may be actively carried on.

Cold-bathing is another aid to health. With a good circulation there is nothing more calculated to keep the skin in a healthy state; for on it depends to a very great extent the regularity of every function in the child. When early practised, children will grow up to revel in the luxury of cold water, coming out of it with a skin at first mottled like the slate-grey lines that permeate hard soap; and subsequently under friction, gradually becoming red, as the blood passes more quickly through the capillaries. The tonicity of these vessels is increased, and that relaxation and debility which render them helpless to contract on exposure, is in a great measure guarded against. When the latter condition exists, children are very liable to cold and affections of the respiratory organs.

Aperient medicines should be delayed as long as possible, but if they must be resorted to they should be of the simplest kind. I always endeavour to avoid bulky powders. Frequently they are not properly mixed, and as often they are not swallowed. The aromatic syrup of senna is not difficult to administer, and the syrup of rhubarb is enough to move the bowels of young children, regularly and efficiently, if continued a little time, and there be no necessity for promptitude in our measures.

Honey or treacle spread on bread is a favourite laxative with some persons. The syrup of roses may be given with an equal quantity of castor oil, and there are few children who will not take it. Infants of a few weeks or months old will suck readily a teaspoonful of a mixture made with castor oil, white sugar, and carbonate of magnesia, with two minims of oil of dill to the ounce (Form. 23). It is a good combination where there is costiveness and painful flatulence. Dinneford's solution of magnesia is a safe and useful antacid and aperient for young children, dispelling flatulence, and gently stimulating the peristaltic action of the bowels. An equal quantity of syrup of rhubarb may sometimes be advantageously combined with it. In feverish states, with constipation, young children will take a mixture containing a grain or two of nitrâte of potash with a few grains of sulphate of magnesia, when sweetened (Form. 8). In hot and excited states of the system we may order with most excellent effect, a purgative and alterative lozenge composed of one grain of calomel and two grains each of scammony and jalap. It is well to order it to be given the last thing at night, as it then empties the bowels fully and effectually early in the morning. It causes copious and full evacuations, freely unloading the liver and small intestines; and in cases of feverish excitement, it has acted in my hands like a charm.*

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* See Chap. XV, "On Constipation," where this subject is more fully considered.

How frequently do we see the ill effects of aperient medicines, when had recourse to on any accession of real or fancied ailment. If the medicine employed is simply of a laxative character, and the child is in even tolerably fair health, the mere evacuation of the intestinal contents can do no harm, and the child is none the worse if not the better for the experiment. But many are not satisfied with this mild class of remedies, and they select some cathartic purge which throws the intestines into violent commotion, unduly stimulating and exciting the mucous follicles, and irritating the whole intestinal tube.

Children are often brought to us, looking pale and languid, with a dark areola under the eyes and a furred tongue. We ascertain, perhaps, that the trustworthy nurse considers them bilious, and gives them grey powder once or twice a week. They have very little appetite; the bowels do not act for want of power; they complain of being tired and are glad to go to bed. These are the cases which run into anæmia; enlarged glands spring up about the neck, and if there happen to be a strumous taint, we get abdominal or pulmonary disease. The syrup of the hypophosphite of iron, with or without quinine, is very valuable, and Parrish's chemical food (Syr. Ferri Phosph. co.) will effect, in such cases of pure debility, a marked improvement in the health and appearance of children. The syrup of the iodide of iron, in cases of anæmia with a disposition to swollen cervical glands, is a well-known but overrated remedy. I am very doubtful if it possesses any real value. We may employ it in many cases of chronic cough and debility, with or without a few drops of ipecacuanha wine; where we have any reason to suspect a tubercular origin we may give it very early. The Vinum Ferri is a slightly astringent preparation. We may sometimes prescribe with good effect a steel powder, consisting of one grain of sulphate of iron and three grains of sugar. Children take it with a relish, either in water, sherry or ginger wine. It is a cheap tonic, and is very available for hospital patients. A most excellent preparation is reduced iron (Ferrum Redactum); it is a valuable remedy in anæmia, chorea, and general debility. A grain or two may be given on bread-and-butter twice or three times a day. It has the advantage of being tasteless, and a very small dose is required. Then there is the iron lozenge (Troch. Ferri Redacti), which no child will refuse to take. Each lozenge contains one grain of reduced iron, mixed with refined sugar and gum acacia; one may be taken after each meal.

Iron is more valuable as a tonic than quinine; it is less stimulating, is a good blood restorer, and strengthens and invigorates the nervous and circulating systems, on which the regular performance of all the bodily functions depends. These forms of iron regulate the bowels by the gentle stimulus they impart to the muscular fibre of the intestines, and the alteration they effect in the constituents of the blood. Dissatisfaction is sometimes felt at the apparent inertness of these agents, but this often arises from their being discontinued too soon or not given regularly.

In chronic forms of illness, parents and nurses are apt to grow negligent in giving medicines according to the rules laid down by the medical attendant. In acute forms of disease they are more regularly given, and hence they often obtain a credit which is not their due.

Antimony is a medicine seldom required in the ailments of young children. It is so depressing that unless the disease is urgent, as in croup, and a few other diseases, we may dispense with it and choose ipecacuanha, which is not so lowering, frequently as effective, and much more manageable. "A few doses of tartar emetic will render an infant pale and prostrate, and in not a few instances will destroy life; for, although the vaso-motor nerve is more active than at any other period, its power more quickly ceases."*

Emetics are often required for infants and young children, who vomit readily, the act being accomplished without the straining and distress which are experienced in adults, because the stomach is not so conical in form as in later life, but is more elongated, and resembles rather a dilatation of the intestines. Emetics should be withheld from children with head affections; in peritonitis or acute abdominal diseases, or where there is great debility; but in the early stage of many disorders, as in croup, they promote the free action of the skin, and at a later stage favour the expulsion of false membrane from the trachea. In whooping-cough, pneumonia, bronchitis, and the early stages of the exanthemata, emetics are of great utility in reducing the force and fulness of the pulse, in lowering the tension of the vascular system, and in promoting secretion. The thick and tenacious secretion which clings to the glottis in whooping-cough becomes thinner and more easily detached by their action, whilst the hyperæmia of the bronchial mucous membrane is lessened. Emetics are serviceable during the invasion of acute tonsillitis; in some forms of acute indigestion and dyspepsia they are also useful by exciting the liver to freer action, and removing morbid secretions from the stomach. An emetic repeated twice or three times a day, followed by a little warm water to ensure its complete effect, is preferable to one large dose.

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* 'Diseases of the Stomach,' by S. O. Habershon, M.D., 1879, p. 12.

Sedatives are remedies not to be recklessly employed in the diseases of young children. The sooner ignorant minds are made aware of the dangers they incur in giving these medicines without medical advice, the more chance is there of rearing strong and healthy children. The influence of the profession should be brought to bear upon the indiscriminate sale of soothing or teething powders, and the public should be cautioned against them. Under the prevalent and frequently erroneous notion that children are suffering from their teeth, a poor woman, to keep her child quiet, or to get a night's rest herself, gives it a teething powder to send it to sleep.[*] Where there is great excitement of the nervous and vascular systems sedatives are sometimes employed with great advantage. Hyoscyamus, hydrocyanic acid, and the compound tincture of camphor are so important to us that we should find it difficult to get on without them. Tincture of opium, however, requires to be given with the utmost caution. Carelessly administered it may so excite the cerebro-spinal system as to induce fatal convulsions. In administering tincture of opium by the mouth it is well to observe the rule of giving the sixth or fourth of a drop to an infant under three months, and to repeat it as occasion may require; half a drop for a child of six months, and a full drop for a year, adding a drop for every year of the child's age. Fortunately we can often get on without the internal exhibition of laudanum, which is a remedy we regard as dangerous to young children if incautiously given. A child will, however, take a dose of calomel with far greater impunity than an adult, and be infinitely less likely to run any risk from salivation. Bromide of potassium, and hydrate of chloral are now recognised to be of great value in the treatment of children's diseases.

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[*] "In November, 1874, four children died at Romford after taking 'teething powders,' and death was preceded in all of them by stupor, drowsiness, and insensibility. These dangerous symptoms set in soon after the powders were given, and were clearly due to an overdose of opium. Dover's powder appears to have been the form in which opium was administered."—*British Medical Journal*, Nov. 14th, 1874, p. 622.

"In 1846 I also was distressed to find the use of opiates among children very prevalent in manufacturing districts. In this case the motive was not criminal, for the practice had arisen in ignorance of its bad effects. But it was not difficult to trace a large amount of direct and indirect mortality to this pernicious custom. Among children the administration of opiates, under the names of quieters and soothers, is nearly as destructive to health as the excessive use of alcoholic stimulants among adults. The craving for both arises from those depressing physical causes of disease which abound in cities." —Sir Lyon Playfair, "On Sanitary Reform," Social Science Congress, Glasgow, Oct. 3rd, 1874.

To sum up these points, it is to be observed that I have laid stress—

1. On the peculiar forms which disease assumes in childhood, as distinguished from the forms of the same disease prevalent in adults;
2. On the rapidity with which functional sometimes passes into organic mischief, during the period of bodily and mental development; so that no ailment should be considered too trivial to receive attention;
3. On the great importance of looking to constitutional symptoms rather than to local derangement, because the primary disturbance may be of greater moment than the secondary effects;
4. On the necessity of looking to diet, and adapting the quality and quantity of the food to the age and natural strength of the child;
5. On the importance of selecting medicines, when medicine is absolutely demanded, from that class which will support the bodily powers and assist in maintaining each function as nearly as possible at a normal standard.

It is my object in the following pages to carry out these general principles, and to show how they are to be adapted to particular diseases, and what exceptional treatment each disease seems to warrant.

CHAPTER III

DENTITION

SYMPTOMS.—*In healthy children there is often an absence of suffering—In the rickety and delicate, abdominal or cerebral disease may spring up—Temporary and permanent teeth—Order of their appearance—Diarrhœa—Convulsions—Eczematous affections of the skin.*—CAUSES OF DIFFICULT DENTITION—*The rickety constitution—Vaccination.*—TREATMENT—*—Depends upon the strength and constitution—The strong and vigorous to be treated differently from the feeble and rickety—Aperients—Carminatives, bromide and iodide of potassium, hydrate of chloral—Lancing the gums—Care in diet.*

DENTITION is a subject which requires careful consideration, for it is important that we should form definite ideas concerning the part it plays in affecting the health and exciting convulsive and other diseases. Whilst the dangers of dentition have undoubtedly been exaggerated by some authorities, and the friends of the child are apt to become anxious during this period, there is, it must be remembered, a real degree of risk in certain temperaments. Every thoughtful practitioner ought to be on the watch for indications of disease, which the process of teething is capable of exciting.

In perfectly healthy children the teeth appear one by one in regular succession with little or scarcely any suffering; in other instances, as in the rickety, their advent is contemporaneous with the commencement of delicate health; and in another class they are the harbingers of abdominal or cerebral mischief. The evolution of the teeth tests the vigour of the child, and the more tardy and lingering the process, the less is its strength and vitality.

The teeth begin to appear in healthy children between the seventh and eight month, and the process is completed between the twenty-fourth and thirtieth months.* The two middle or central incisors in the lower jaw first appear; then in the course of a week or two the two middle incisors in the upper jaw, next come in another month or six weeks the two lateral incisors in the upper jaw, followed by the two lateral incisors in the lower jaw. Then about the twelfth or fourteenth month the first four molars appear, generally those of the lower jaw first; but they do not follow any definite order in their appearance. After the lapse of another three or four months the four canine teeth succeed, and between the twentieth and thirtieth month the four posterior molars pierce the gum, thus completing the number of twenty teeth. These are called *temporary* teeth. The *permanent* teeth are thirty-two in number, and they make their appearance as the former are shed.

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* "If a child pass over the ninth month without teeth, you should carefully inquire or the cause. It may be that an acute illness has retarded dentition. It may be (but

The *permanent* teeth belong to that important period of childhood—the *second* dentition. These teeth begin to appear between the seventh and eighth year, and at this time there are forty-eight, twenty deciduous, or perfectly developed teeth, and twenty-eight permanent teeth in various stages of development. The evolution of the first true molars are, according to Sir Edwin Saunders, an evidence that the child has attained the age of seven years.

The following table is of assistance:

Central incisors developed at		8 years.
Lateral incisors	,,	9 ,,
First bicuspid	,,	10 ,,
Second bicuspid	,,	11 ,,
Canines	,,	12 to 12½ years.
Second molars[*]	,,	12½ to 14 ,,

Symptoms.—The symptoms and disorders that accompany the first dentition vary in different cases. A perfectly healthy child may not suffer in the least degree, one tooth appearing after another without causing any local or general disturbance; but, in many instances the excitement is considerable; the mouth is hot and swollen; the cheeks are flushed; the child is fretful and sleepless; it resents the slightest interference; the appetite fails; thirst is

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this is very rare) that there is some condition of the gum which interferes with the advance of the teeth. It may be (and this is infinitely the most common cause of late dentition) that the child is rickety; fail not then, when called to a child in whom the teeth are late in appearing, to look if it be rickety, for, if you do fail to look for rickets, you will most likely attribute to the irritation of teething symptoms which are the consequence of the rickety diathesis—the late dentition in rickets being in itself merely a symptom of the general disorder. The rickety deformities may be very trifling, and yet the teeth considerably retarded in their development."—*Lectures on Rickets*, by Sir Wm. Jenner, Bart., M.D. 'Medical Times and Gazette,' vol. i, p, 334.

[*] 'Carpenter's Physiology,' 8th edit., p. 1106.

present, and often sickness and diarrhœa as well. One of the earliest symptoms attending dentition is an increase in the activity of the salivary glands, and saliva is seen to be constantly drivelling from the mouth; but this moisture may be present for some weeks before the teeth appear. In some cases the constitutional disturbance is even greater than that which I have described; the mouth is hot and dry; aphthous ulceration is seen on the gums and inside of the cheeks; the tongue is thickly coated, and the child can no longer suck. Convulsions and spasmodic movements are very common in teething children. Frequent contractions of the muscles of the eyes, the lids of which are only partially closed, and the eyes turning upwards beneath the upper eyelids, so that the white sclerotic is only seen, give a terrified expression, and is alarming to the parents. Rolling of the head, twitching of the facial muscles and of the limbs, flexion of the toes and fingers, and a peculiar smile are often observable at such a time. In this state of excitement almost any sympathetic disorder may spring up, as bronchitis, convulsions, meningitis, diarrhœa, and eczematous and erythematous affections of the skin. Some of these affections are quickly fatal, and others tedious and difficult of cure. In rickety children dentition is delayed. They are feeble in constitution, the appetite is capricious, sleep is disturbed, and the bowels are relaxed.

During dentition, children are very liable to diarrhœa, the mucous membrane of the bowels is irritable and sensitive, and if the food given be not easy of digestion, or if the weather be cold, it is easily induced. What share teething exerts in causing diarrhœa it is impossible to say; but there is a close connection existing between these states. When diarrhœa is present we do not hastily attempt to check it if the teeth are piercing the gums, and the mouth is uneasy; still, if the drain continues or is excessive the child becomes exhausted, and the possibility of convulsions must not be overlooked.

Diarrhœa may be in some measure due to enfeebled digestion caused by pain and restlessnesss and general disorder of the system. Billard attributed it to an increased development of the intestinal follicles and glands, which is noticed at the period of dentition.[*] A year of delicate health may elapse before a tooth is seen, and then one may slowly appear without causing pain. Convulsions in a case under my care preceded the appearance of each tooth.

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[*] "On the Dangers of Dentition," by J. Finlayson, M.D., 'Obstetrical Journal,' 1873-4, p. 591.

Children who suffer from difficult dentition will be often observed to roll the head from side to side, and to raise the hand to it, or put the fingers in the mouth. Sickness and febrile disturbance are noticeable; the child becomes languid and wastes, the muscles are flabby and the joints relaxed, the motions are offensive, and dark, green, or slimy. Slight ulcerations of the mouth are common, the child is peevish and irritable, it experiences pain on taking food, and does not obtain sound sleep.

In some rickety children during dentition, sickness and vomiting are the chief symptoms, and the child is drowsy and inclined to sleep at any time during the day. If the head is also hot, and the veins are distended about the scalp, the pulse quick, and the temperature runs up to 101° or 102°, we may dread the supervention of convulsions or meningitis. Convulsions in several children of the same family are often to be met with. In one instance a mother had lost three children from convulsions during dentition; the fourth child was the subject of laryngismus stridulus, and at two years old it had only seven teeth. Laryngismus stridulus frequently attends dentition in rickety children, the seizure passing off as the teeth appear, and the general condition improves. Eruptions on the face and scalp have been usually attributed to dentition—the "tooth-rash" of vulgar talk.

The *causes* of difficult and delayed dentition are an acute disease, the rickety constitution, struma, and marasmus. All these disorders retard the development of the teeth, by lowering the general health.

In some cases we may trace the failure of health to the time of vaccination when it is performed at the third or fourth month; this in many instances seriously interferes with the development of the teeth, and disposes to reflex nervous irritation.

The mortality under the age of two years has been variously estimated by different writers, some ascribing half the deaths, others a third, and others again, a sixth, as due to difficult dentition.

The *treatment* of dentition will depend upon the general symptoms that are present, and the constitution of the patient. The practitioner must exercise his own judgment as to the treatment he will adopt, and not blindly attach himself to any routine plan. The strong and vigorous child who is feverish and thirsty, with a hot and tender gum, a full pulse, and constipated bowels, will demand quite a different mode of management from a puny and rickety child whose teeth are delayed. In strong children a grain of calomel with two or three grains of rhubarb will be required to clear the bowels. A saline mixture, as the citrate of potash, should be given to abate the pyrexia, and if the child is excited and sleepless, a few drops of tincture of henbane may be added, or a draught at bedtime containing hydrate of chloral and bromide of potassium, should be given. The child's head should be kept cool, and whatever determines to cerebral congestion should if possible be prevented. Bathing the head frequently with cold water, or cold affusions of the head are useful in the convulsions of children whether they occur during dentition, or from any other cause. I have repeatedly practised this with advantage.

In the rickety, a mild aperient is occasionally required, such as bicarbonate of soda and rhubarb, to regulate the bowels, and to correct the secretions. A teaspoonful of castor oil may be advisable now and then, and if the bowels are over active, a grain of Dover's powder at bedtime is often of great service. If there is vomiting and flatulence some carminative will be necessary. A mixture containing hydrocyanic acid with solution of magnesia and sal volatile often answers exceedingly well.* In cases where there is much restlessness and disturbance of the nervous system, bromide and iodide of potassium with sal volatile will often abate sickness, and relieve head-symptoms if present.†

The *gum-lancet* is occasionally required. If the tooth is nearly through, but still hidden, and the gum is red and tightly stretched over the tooth, then a proper incision will give much ease, and the slight bleeding will relieve the capillary vessels. It is both mischievous and cruel to have recourse to the practice if dentition is going on naturally. This practice of lancing the gums is a very old one. It appears inconsistent with the state of medicine in the present day to suppose that puncturing the gums would be so frequently resorted to if it had no advantages. "May not some diseases be rendered milder, and their favorable termination more certain or probable by measures calculated to relieve the turgescence of the gums? If so, those who totally disregard the state of the gums, are not less in error than those who use the gum-lancet when it is not required."* The cases where incision is required are probably few, but there are undoubtedly some which do benefit by the operation, and where convulsions have been prevented by having recourse to it. When the gum has yielded to the advancing tooth a child often experiences instant relief and comfort. So far from causing the infant pain, I have repeatedly lanced the gum without the child evincing the slightest indication of feeling pain from it, but of obtaining speedy relief. I have never seen hæmorrhage or ulceration of the gums follow, and in properly selected cases it certainly has its advantages.

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* Form. 2:
℞ Acid. Hydrocy. Dil. ♏ss
Spt. Amm. Arom. ♏ij
Syrupi — ♏xx
Liquor. Magn. Carb. ʒj.
M. To be taken every four hours.

† Form. 3:
℞ Potass. Bromid. gr. ij
— Iodidi gr. ¼
Spt. Amm. Arom. ♏ij
Syrupi — ♏xx
Aquam ad ʒj.
M. To be taken every four hours.

For children a year old.

Finally, care in diet is of the greatest importance whilst a child is teething. Improper food will easily bring on acute indigestion and febrile excitement, demanding the use of salines and aperients till the system is again tranquil.

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* 'Diseases of Children,' by J. Lewis Smith, M.D., 1869, p. 307.

CHAPTER IV

MARASMUS OR ATROPHY

Nature and definition of—Deficient food the most common cause—Mortality among infants—In treatment the primary object is to remove the cause—Care in feeding—Cod-liver oil—Raw meat juice—Digestive ferments—Liquor Pepticus and Liquor Pancreaticus—Saline essences of pepsine and pancreatine—Acid glycerine of pepsine—Artificial digestion.

ATROPHY consists in the decrease of size of a tissue, or of the whole body, with consequent impairment of function. It is the opposite state to that known as hypertrophy. When adipose tissue atrophies, the fat cells diminish in size, owing to the gradual loss of their contents, and emaciation results. The elementary constituents of any other tissue, or organ, or set of organs may become similarly affected, and so produce diminution in size, and a proportionate impairment of function. It is not the same process as degeneration, although degeneration is always sooner or later accompanied by atrophy. Degeneration consists in the deterioration of the *quality* of a tissue, and does not (at all events at first) necessarily imply diminution in its size. On the contrary, the size may be temporarily increased, as, for instance, in fatty degeneration of the liver.

Atrophy is a common disease among infants and young children, as the out-patient practice of any London hospital amply testifies. It has its origin in defective nutrition, and is rather to be regarded as a state of extreme debility and lowered vitality than as a specific and independent affection.

Patients often die without any change being detected in the condition of their organs. Claude Bernard found from his experiments that dogs may reach the last stage of emaciation although the appetite is unimpaired. They sink from exhaustion while the lacteals are gorged with chyle.*

Causes.—Whatever interferes with the nutrition of an organ is followed by its atrophy. If the food given to an infant be unwholesome or deficient, the digestive organs are sooner or later deranged, and the processes of assimilation are disturbed. The nutritive changes in growing tissues are far more active than in the mature; consequently any interference with the nutrition of an infant is followed by far more rapid and serious consequences than in the case of an adult.

It has been pointed out by Dr Murchison that emaciation may arise from functional derangement of the liver, as when the bile is impeded in its passage into the bowel, and the assimilation of fatty and albuminous matters is interfered with, or from derangement of the glycogenetic function of the liver.† It may also arise from stricture or obliteration of the thoracic duct; by which means the chyle elaborated by the mesenteric glands fails to reach the general circulation. Atrophy is also caused by whatever occasions any great waste of nutritive material. Thus, prolonged hæmorrhages, long-continued suppuration, excessive vomiting and diarrhœa, by depriving the body of large quantities of nutritive matter, lead to general atrophic changes.

As to some other *causes* of atrophy, the most frequent are any circumstances that bring about defective nutrition in infants and very young children. A child may have been born healthy, but the mother is suddenly unable to suckle it, and from that moment it ceases to thrive. No artificial food can effectually take the place of the mother's milk, the child wastes and becomes emaciated, diarrhœa and vomiting ensue, and it dies exhausted. In another class of cases the child is incessantly sick, and life is frequently arrested by an attack of convulsions. Hundreds of infants die annually in London and other large cities because the food given to them is either unwholesome, indigestible, or insufficient, their digestive organs are too feeble to assimilate it, or the mother is working hard, and in delicate health at the same time, and so has not sufficient breast milk to nourish her infant. We continually see pale and feeble women bringing up their children by the breast when a year old, and they tell us with some surprise that since their milk diminished the children have not thriven. The blood, in these cases, gets into a thoroughly impoverished state, and the mammary glands can no longer secrete milk sufficient in quantity, or good in quality.

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* "Lecture on Experimental Pathology," 'Medical Times and Gazette,' 1860, vol. i, p. 209.

† "Croonian Lectures on Functional Derangements of the Liver," 'The Lancet,' 1874, vol. i, p. 467.

It has been pointed out that food rich in starchy products is a common cause of atrophy in young children when given to them before the salivary and pancreatic glands have reached their full development. Before the seventh or eighth month the starch is not converted into glucose or sugar, and hence one cause of indigestion and defective nutrition.[*]

The mortality among infants brought up by hand is enormous.[†] The deaths during the first two months are four times the number during the third month.[‡] Where infants are imperfectly fed, nutrition takes a wrong direction, and if they do not flag or die early, then some morbid deposit in the shape of tubercle may be infiltrated into the different organs, or some inflammatory affection set up.

Sometimes young children, without any ascertained cause, suddenly become fretful and irritable, and lose flesh and strength; the face grows pale, and the body-heat diminishes; in these cases they sleep badly, there is uneasiness in the bowels; the motions are dark and offensive, and death gradually follows.

"In chronic atrophy the last traces of adipose tissue disappear from the face; the integument everywhere becomes loose and corrugated, and, in addition, various contractions of the muscles take place, as a result of cerebral irritation, especially that of the frontal, next of the corrugator supercilii, and the levator alæ nasi et labii superioris muscles, by which the face acquires a senile appearance, and, on account of which, the French Pædiatricars, in a very ungallant manner, call it a Voltairean face."[*]

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[*] See Chapter II.

[†] "In England, out of 100 children born; while for the whole period of one year 15·2 per cent. children will die the first month, 1·7 the next, and so on. In France, out of a million births, 29,121 die in the first week, 22,128 in the second, and 22,236 in the sixteen days following."—*On Infant Feeding*, by C. H. F. Routh, M.D., 1876, p. 64.

[‡] "According to the English Life-Table, of 1,000,000 children born, 149,493 die before they reach the age of one year; and of these 149,493 deaths, 46,503, or nearly a third, die during the first month of life. The annual rate of mortality per 1000 among infants, according to this English Life-Table, is equal to 571·3 in the first month of life; declining, however, to 91·6 per 1000 in the eleventh month. The annual rate among infants aged one month and under one year does not exceed 114·6 per 1000; whereas among infants from birth to one year of age it is equal to 165·6. It is evident that in dealing with the mortality among infants during the first year of life it is necessary to take account of the age in months at insurance, for the rate of mortality among infants aged six months is but one-fifth of the rate which prevails during the first month of life."—*Infant Insurance and Mortality*, 'Brit. Med. Journal,' vol. i, 1875, p. 785.

It should be mentioned that a frequent cause of atrophy in children is due to congenital syphilis.

In the *treatment of Marasmus and Atrophy* we must seek to remove whatever influences appear to have induced the disorder. If the mother has not milk enough to support her infant, a wet nurse should be procured, or it must be brought up by hand, and every care ought to be bestowed on feeding, according to the age and digestive capabilities of the child. Into this question I have already entered.[†] Cod-liver oil may be given to young infants after food in these cases, with the greatest advantage; it will have the effect of improving the appetite, promoting sleep, correcting the secretions, and increasing weight. When it does good, sickness is not induced; indeed, I have seen many infants cease to be sick on taking the oil. Half a teaspoonful of steel wine may be added to the oil in suitable cases. If cod-liver oil cannot be borne an equal quantity of glycerine may be given with good results. It is usually taken with relish. Inunction of cod-liver oil is also of service. *Raw meat juice* in some cases of atrophy and wasting proves highly nutritious and digestible. The directions for preparing it are given in another place.[‡]

In cases due to syphilis, mercurial treatment is indicated.

Cases will sometimes occur in which the digestive functions are completely in abeyance. All foods are rejected by the stomach or passed undigested by the bowel. In such cases as these, as, indeed, in all where the alimentary tract is in a high degree of irritation, the principle of physiological rest will be found to be of great value. We must give the digestive organs as little to do as possible; as they cannot perform their functions effectually, we must relieve them of this, by introducing artificially digested food, and thus reduce their work to that of mere absorption. This can be effected by "peptonising" the food before it is given. There are several valuable preparations of the digestive ferments in the market, while many are practically inert. Amongst the most effective may be mentioned Benger's preparations, the "Liquor Pepticus" and "Liquor Pancreaticus;" Savory and Moore's two saline essences of Pepsine and Pancreatine, Bullock's Acid Glycerine of Pepsine (which, on account of its sweetness, is readily taken by children), and others. The strength of these preparations is very similar. Dr W. Roberts has called attention to the subject in his Lumleian Lectures on the Digestive Ferments. He says: "Any extract of pancreas may be used for the preparation of artificially-digested food, but the most suitable are those prepared with dilute spirit or chloroform-water. The extract sent out by Mr Benger, under the name of 'Liquor Pancreaticus,' is an almost faultless pharmaceutical preparation. It is made by extracting perfectly fresh and finely-chopped pancreas, with four times its weight of dilute spirit. By some ingenious devices, Mr Benger has succeeded in overcoming the mechanical difficulties of the manufacture, and has produced an extract which possesses the diastatic and proteolytic properties of the pancreas in a highly concentrated degree. It is a nearly colourless solution, with very little taste or smell beyond that of the spirit used to preserve it."* The following are Dr Roberts's methods of artificially digesting milk and milk-gruel:

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[*] Vogel, 'Diseases of Children,' 1874, p. 15.

[†] See Chap. II.

[‡] See Chap. XIII, "On Diarrhœa."

"*a.* PEPTONISED MILK.—Fresh milk is diluted with water in the proportion of three parts of milk to one part of water. A pint of this mixture is heated to boiling, and then poured into a covered jug. When it has cooled down to about 140° Fahr., three teaspoonfuls (fʒiij) of the Liquor Pancreaticus, and twenty grains (about half a small teaspoonful) of bicarbonate of soda (in solution) are mixed therewith. The jug is then placed under a 'cosey' in a warm situation for one hour. At the end of this time the product is again boiled for a couple of minutes. It can then be used like ordinary milk.

"*b.* PEPTONISED MILK-GRUEL.—Half a pint of well-boiled gruel is added, while still boiling hot, to half a pint of cold milk in a covered jug. The mixture will have a temperature of about 125° Fahr. The Liquor Pancreaticus and the bicarbonate of soda are then added in the same proportion as in the preceding process (*a*). The jug is placed under a 'cosey' and kept warm for an hour and a half. The contents are then boiled for a couple of minutes, and the product is ready for use. By this second method the use of the thermometer is dispensed with."

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* Lumleian Lectures, "On the Digestive Ferments," by W. Roberts, M.D., F.R.S., 'The Lancet,' April, 1880, to which the reader is recommended to refer for further particulars.

In cases of great debility and exhaustion it may become necessary to feed the child per rectum.

The following is Dr Roberts's plan of preparing nutritive enemata:—"A nutritive enema should be prepared in the usual way—of milk, or of milk with beef tea or eggs, or of milk-gruel. To half a pint of the warm enema a tablespoonful of the Liquor Pancreaticus, and thirty grains of bicarbonate of soda should be added. The enema can then be administered at once."

Two ounces is quite sufficient at one time, for if more be used it may not be retained.

CHAPTER V

FEVERS OF CHILDHOOD

Definition of fever—Its causes and symptoms—Action of the fever-poison on the blood and nervous system—Termination by critical change or crisis—General management of fevers, prophylactic and curative—Simple febricula—Febris ephemera—Febris continua simplex—Its definition, causes, symptoms, and treatment.

THE term fever is employed to signify an accelerated state of the circulation, with thirst, loss of appetite, elevation of temperature, prostration of the mental and bodily powers, and derangement in the secreting functions. These changes are the consequences of external causes, which the system is unable to resist. The causes may be sudden or slow, powerful or mild; they may temporarily impede its actions, and eventuate in a speedy restoration to health; or they may induce a combination of phenomena which destroy the life of the patient.

All diseases which exhibit febrile symptoms at their commencement must have a close resemblance to one another, and do not then admit of a diagnosis, which is easy at a later period, when the development of particular symptoms enables us to fix the exact nature of the affection, and in many instances to trace its origin. Different individuals are variously affected according to peculiar circumstances, and the state of the general health at the time of attack. Thus exposure to cold and moisture in one person produces only a feeling of malaise and general constitutional disturbance; it does not fix upon any particular organ, and terminates without complication. In another person, as the general disease advances, there is a determination of the complaint to some organ; or in a third person the local disease may proceed as rapidly or even more so than the general disorder; and this is exemplified in some cases of pneumonia occurring in young and vigorous subjects. Then there is a class of cases in which the local disorder precedes the constitutional, and the inflammatory symptoms increase and become more developed, whilst the symptomatic fever and general derangement follow later.

Increased heat and accelerated circulation constitute fever, and without them the patient cannot be said to labour under it. In the early stages they may be absent, as during the period of depression and lassitude, when the vital energies are prostrate, and before the system has shown any reaction. But quickly come remarkable changes and manifestations, as uneasiness, restlessness, shivering, coldness along the spine, involuntary tremors, rigors or convulsions, and exacerbations. And to these succeed lesions of the organic functions, in disturbed respiration, circulation, digestion, and nutrition: the attitude is altered, the expression changed, and the intellectual powers are enfeebled or destroyed. The symptoms are owing to changes in the quality and constituents of the blood, which becomes altered in colour and consistence, the serum increased, and the crassamentum thickened or loosened. Then follow changes in the quality and amount of the secretions; they become putrid and offensive to the tissues in which they are in contact, and lead to local inflammations and changes of structure. The fever-poison enters the blood and paralyses the nervous system—it affects all the solids and fluids of the body, and tends to the disturbance of its several functions. It is well that we should bear in mind the liability of the mildest form of fever to change its characters and become developed into a dangerous type at some period of its progress; and hence it is that very mild cases of typhoid (remittent) pass off in a few days, whilst in others they become severe, protracted, and even fatal. From constitutional infirmity or improper diet alarming symptoms may arise at any period of the fever, or if the blood is surcharged with the contaminating elements of tissue metamorphosis, which the excretory channels cannot eliminate, coma or delirium may set in unexpectedly and destroy the patient's life. Thus it becomes a trite maxim, which observation daily endorses, that "where there is fever there is danger."

All fevers have a tendency to terminate by critical change or crisis, as it has been termed, if the vital powers are not too much exhausted. This is seen in ague and some idiopathic fevers, in which a free sweating, or evacuation from the bowels, is followed by favorable symptoms.

In the management of fevers in general there are prophylactic and curative measures to be borne in mind. If the causes which produced the fever can be ascertained they should be removed, and the patient placed under the most favorable hygienic conditions. Such measures should be resorted to as support the constitutional powers and encourage the due performance of the different functions of the body. Excess of food, by inducing vascular plethora and general excitement, will predispose to fever, whilst moderate exertion of the mind and body, and the inculcation of habits which neither over-excite nor depress, will diminish the risk of infection. In districts where the soil is low and heavy, and there are many trees, children should not be exposed to the night or morning air on an empty stomach, and if it can be managed their apartments should be at the top of the house. In the autumn season of the year an occasional dose of quinine and a mild aperient will be advisable in unhealthy localities. In short, a due regulation of the digestive and secreting functions should be observed, and all causes that morally or physically depress the system should be carefully avoided. When the impression of fever has been made, its full development may sometimes be prevented by a careful diet, rest in bed, laxative medicines, and cooling drinks; by the employment of a warm bath, or determining the blood to the external surface. Although these measures may not arrest the fever, they will control the premonitory stage, and render the subsequent disease milder and shorter in its duration. We shall treat of the serious complications that arise in the course of the specific fevers under their respective heads.

Simple febricula, or feverishness, is the term I would employ to express a slight degree of febrile action. It may be classed as a mild grade of inflammatory or continued fever terminating in twenty-four hours, or lasting over a few days. The affection is not peculiar to children and may occur to adults. The mildest variety is generally caused by fatigue and exposure to the sun in hot weather, or by prolonged mental excitement, or by continuous study in close rooms. I have met with several instances of this kind and almost invariably in the summer season of the year, when the weather has suddenly changed, and become hot and relaxing. In May, 1877, three children, aged respectively five, seven, and eight years, were brought to me in the Out-patient department of the Samaritan Hospital on the same day with temperatures varying from 101·6° to 104·4° (rectum). May 14th.—The youngest child had the highest temperature. She had been ailing for a week, refused food, and was extremely thirsty and fretful; there was a shrill croupy cough, and the hands and body were very hot; pulse 140, respirations 50 per minute; the tongue was whitish and moist, and one or both cheeks flushed both morning and evening: there was no diarrhœa, and the urine was clear. I thought the case very like typhoid fever, or acute tuberculosis; rather the latter affection. I ordered half a grain of quinine in a powder with sugar night and morning, and a mixture of citrate of potash and bromide of potassium three times a day. On the 17th she was no better, refusing beef tea and scarcely taking any milk; there was constant cough and the bowels were inclined to be loose. The temperature in the rectum was 104·2°, pulse 140, respirations 50. On admission as an in-patient two days later (19th), although no change had been made in the treatment, the temperature at 8 p.m. was 98·2°, and it never exceeded 98·6° during the month she remained in the hospital. On a careful examination of the thorax some slight mucous râles were detected when the child coughed or cried, but there was no dulness anywhere. The urine was cloudy and contained *phosphates* in abundance. A mixture of phosphoric acid and quinine was prescribed, and a week later the child was running about the ward, eating an ordinary diet, and left the institution on the 16th of June quite well. In the absence of local or specific disease, we must classify these cases as "simple febricula" or "pyrexia."

This fever is also the consequence of local irritation and temporary obstruction to the digestive functions. If the source of irritation resides in the stomach from an undigested meal, an emetic gets rid of the offending mass, and subdues the fever at once. If digestion has advanced to the stage of imperfect chylification, the separation of nutritive elements does not properly take place, and absorption of well-selected elements does not ensue; whilst there is retained in the intestinal canal matters which also become sources of irritation till an active aperient washes them out of the system. Hence the rapidity with which this simple variety of fever departs, leaving behind it no ill effects. Worms in the intestinal canal, excessive secretion of bile, or indulgence in stimulants may induce it. However simple the fever may be, it is marked by a coexistence of symptoms, and is not characterised by any single one. It depends on a variety of exciting causes, and is not specific, nor does it present anything of a definite character like those cases of fever arising from contagion, in which there is a change in the healthy proportion of the constituents of the blood. During the period of the first dentition the infant is liable to pyrexia, which passes off with the appearance of the tooth through the distended gum; or it may have convulsions, which may depart quickly or return from time to time, and even end fatally if the process is slow, and the constitution is intolerant of the irritation through excitability of the nervous system. When the fever arises from the various causes which excite gastric or intestinal disorder, it may be called symptomatic fever, for there is neither shivering, brown tongue, nor active cerebral disturbance, which belong to the exanthematous fevers. Still caution is necessary, as severe fevers often set in with very mild symptoms. It is doubtful whether such cases ever lead to a fatal termination. The temperature from slight sources of irritation in these cases may rise to 105° Fahr. in the evening (as high as is common in typhoid fever) and fall to the normal point next morning. In fact a high temperature in children is often a delusive indication when not viewed in connection with other symptoms.*

In this symptomatic fever (for I still cling to the term in the short variety of the affection) the lassitude and general weakness are usually slight, because the nervous centres are not severely depressed, whereas in the specific fevers they are sometimes involved to a great extent, and the cerebral functions are destroyed or seriously involved, as when effusion takes place.

Treatment.—This consists in the first instance in giving cooling drinks, and, in the shape of nutriment, nothing beyond milk and seltzer water. A few alterative doses of grey powder and rhubarb, or a brisk purge, will bring down the temperature and soon set matters right. Sometimes an emetic acts like a charm. The cause has only to be removed, and, if not long in operation, the child is quickly restored to its usual health. There is no serious congestion or irritation of any particular organ, and consequently the depurating functions are only temporarily impaired. As soon as the fever begins to decline (or before, if there is much moisture on the skin) quinine given three times a day will be found of great service. In those cases where there is a febrile paroxysm morning and evening, I am in the habit of giving quinine before it is expected to come on, and when it is fully developed, I recommend a simple saline mixture, cooling drinks, and cold sponging. Where there is much cerebral excitement it is well to give the quinine in hydrobromic acid.

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* "Cases of ephemeral fever, without any very serious foundation (*bedeutungsvolle Begründung*), are particularly characteristic of the period of childhood. Therefore, in children's diseases, even when we find a very high temperature, we must be very careful in drawing conclusions from the first (or a single) observation. At this age also more or less high temperatures may occur at stages (*Punkten*) in the course of a disease, in which we generally find very moderate or normal temperatures in the adult. And even in *convalescence*, especially after muscular exertions, very considerable elevations of temperature are sometimes met with in children."—Wunderlich, *on Medical Thermometry*, New Syd. Soc., 1871, p. 208.

CHAPTER VI

TYPHOID FEVER

Definition and various meanings—Infantile remittent fever and typhoid fever synonymous terms—Symptoms, course, and progress—Relapses, complications, and sequelæ of typhoid fever—Morbid appearances—Diagnosis of typhoid fever from typhus, meningitis, and acute tuberculosis—Treatment—Salines—Local applications—Bromide of potassium and hydrate of chloral to allay excitement—Temperature of sick room—Salicylate of soda—Cold bath—Management of diarrhœa—Avoidance of solid food till temperature is normal—Stimulants—Quinine—Phosphoric acid—Steel.

Typhoid or enteric fever is distinguished by the prevalence of gastric and intestinal symptoms. It has received the name of intestinal fever, and muco-enteritis. Most German writers call it abdominal typhus (typhus abdominalis). In addition to these terms, there is the well-known name of infantile remittent fever.

Typhoid fever may attack children under two years of age, or as early as the eighteenth or twentieth month, but the disease is rare under five years of age. A case is recorded by Dr Dunbar Walker, seen in consultation with Dr West, of "enteric fever in a child fifteen months old,"* and Dr Wiltshire also mentions having seen, with Dr Walters, of Reigate, "a well-marked example in an infant aged six months."†

Typhoid fever follows a course in children similar to that in adults. In the mild form the child is off his appetite and out of sorts for some days; he complains of thirst, is fretful and irritable, and ceases to be cheerful or to take pleasure in his usual amusements; his nights are disturbed and unrefreshing; the bowels are confined, and the motions dark and unhealthy, so as to need aperient medicine, or they may be loose and offensive from the onset. Then succeeds heat of surface, followed by perspiration and a lowering of temperature. During the first week the abdomen may be natural in shape, and free from tenderness; but there soon follow tympanites, and pain over the right iliac region when pressure is applied with the hand. In the evening there is a febrile exacerbation, with accelerated pulse and breathing, the lips become dry, and the tongue is coated on the dorsum with a whitish yellow fur. The pupils are dilated and the conjunctivæ pale. There may be two exacerbations in the twenty-four hours, but commonly there is only one. It is from the recurrence of these exacerbations that the term "remittent" is derived. During the night the child becomes more restless; he is wandering and talkative, and the cerebral functions may be sufficiently disturbed to produce delirium; in the morning he looks pale and exhausted, but improves during the day till evening returns, when he is again feverish and drowsy, with flushed cheeks, and this may happen for several successive nights. Sometimes there is a morning exacerbation (about 10 or 11 a.m.), and this has scarcely subsided before the evening paroxysm sets in. The child now loses flesh and strength rapidly, and is dull and indifferent to all that goes on around him.

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* 'Brit. Med. Journal,' vol. i, 1879, p. 347.

† Ibid., p. 427.

During the *second* week (seldom before the tenth day) fever spots make their appearance on the upper part of the abdomen, thorax, and back. They are frequently altogether absent, or few in number, and their presence does not seem to bear any relation to the mildness or severity of the fever. The eruption is of a light rose colour, oval in shape, and scarcely elevated above the surface, it disappears on pressure, and quickly reappears when the pressure is removed, each spot lasting three or four days. All the symptoms increase in severity, the child cries or moans in its restless sleep, the expression is wild, and the cheeks are flushed with a bright pink patch. The pulse may reach 140 to 160. Sudamina and sweating are not uncommon. The tongue is more heavily furred, or brownish in the centre, and red at the tip and edges. Diarrhœa is continuous, and the motions are of a yellow-ochre colour, and of a thin pea-soup consistence. In exceptionally severe cases blood and mucus may be present, and when so, they indicate more than usual ulceration.

The *urine* undergoes certain special changes. It is scanty and high coloured at the beginning of the disease, and the specific gravity is increased. During the first week the water is diminished to one half or one fourth; during the second and third weeks it gradually increases, and by the end of the fourth week it is again normal if the case is a favorable one. A fall in the temperature is attended with an increase in the secretion. The urea, uric acid, chloride of sodium, and pigment are also increased during the febrile period. At an early stage of the illness, the acidity is greatest, but by the third week it lessens and ultimately becomes alkaline, either from fixed alkali, or the decomposition of urea. Albumen is sometimes present.

Temperature.—A marked feature of typhoid fever is for the temperature to rise in the evening, and to fall in the morning. The evening increase may be to the extent of 2·2°, and the morning remissions 1·1°. On the first day of the disease, the temperature may be normal in the morning, but it rises two degrees in the evening. It goes on gradually increasing day by day, till on the fourth day it may be 101·5° in the morning, and 104° in the evening. If the temperature rises to 104° on the first day of the disease, enteric fever may be excluded, and also if between the fourth and the sixth day, the evening temperature in a child does not reach 103·1°. The disease may also be excluded if during the second half of the first week a considerable or progressive diminution of the evening temperature is met with (Wunderlich). If the evening temperature during the second week is between 104° and 105°, and the morning temperature one or two degrees lower, and there is also a moderate daily decrease of body heat, it is a favorable indication. It is more especially so, if the febrile exacerbation is delayed till about 10 a.m., and the remission occurs before midnight. The temperature is usually highest at the latter end of the second, and beginning of the third week. If the morning temperature continues elevated for any length of time, and the evening temperature rises above 105°, the issue of the case is suspicious, or if the morning temperatures are higher than the evening temperatures. If the temperature remains long at 104°, it is an unfavorable sign. If it continues long above 106°, or it suddenly rises above 107°, death may be expected. A sudden fall of three or four degrees below normal indicates collapse.

About this time (*second week*) there is often hacking cough and hurried respiration. There is constantly to be recognised some rhonchus or coarse crepitation over the posterior surface of the lungs. If the disease has lasted long, we shall almost invariably detect these signs, or crepitant rhonchus with a low degree of pneumonia. If the abdomen has been hitherto free from tenderness, a sense of discomfort and pain is now complained of, and there is more tympanites with gurgling. During the latter half of the second week, the tongue may be glazed, smooth, and red, whilst the gums are dry. The stupor becomes more profound, or active delirium appears, and the child is noisy at night, and attempts to get out of bed; he is unconscious of all that goes on around him, and the evacuations are passed involuntarily. In a few cases, the bladder becomes distended and the urine dribbles away. The child may be noticed to pick his lips and nose till they bleed, and there may be subsultus. By this time there is great emaciation, and the child is so reduced that it seems beyond the hope of recovery. Epistaxis is not uncommon. Some years ago I met with a case in a young girl, and it could not be checked till the posterior nares were plugged. Sloughing of the soft palate and tonsils followed, and the odour from the throat was most offensive. There was in addition severe hæmaturia, and the stools contained a considerable quantity of blood, whilst the legs presented large purple patches as in "purpura hæmorrhagica." During the *third* week, there is more distension of the abdomen and diarrhœa, the bowels acting as many as eight or ten times a day. The strength is still further reduced, and if no improvement sets in, the vital powers become more and more depressed, and the child sinks from exhaustion. Death may happen by the fourteenth or fifteenth day, but it may be protracted to the fourth or fifth week, or be indefinitely prolonged according to the complications that are present. When death takes place during the first week of the fever, it is generally due to cerebral disturbance, or some other serious complication.

In favorable cases, about the beginning of the third week, a general amelioration in the symptoms takes place; the bowels act more regularly, and the stools are more natural; thirst diminishes, the pulse loses its frequency, the tongue is more moist, and the sordes disappear, whilst the febrile paroxysm diminishes. The child resumes a more cheerful and healthy appearance, but he is left weak and emaciated.

In proportion to the severity of the fever, convalescence is rapid or slow. In severe typhoid fever there is great emaciation and muscular prostration, lasting many weeks, and the child is greatly reduced in flesh and strength, but bedsores are seldom seen.

Relapses.—These are not frequent, but they now and then occur during convalescence. Rilliet and Barthez only met with them in 3 out of 111 cases.[*] From ten to fourteen days after a first attack, chilliness, headache, elevation of temperature, and sometimes sickness ensue, with a return of all the former symptoms, including diarrhœa and fever spots. There is also a fresh enlargement of the spleen and mesenteric glands. In a child five years of age, under the care of Dr Murchison, the first attack was twenty-two days, the intermission fourteen days, the relapse ten days, the whole duration forty-six days.[†] The relapse is often more severe than the primary attack. Errors in diet have been considered the most frequent causes, but they are not well understood. Second and third relapses have been spoken of.

Mortality.—Rilliet and Barthez, and some other writers, put the mortality, from 2 to 12 years, at 10 per cent. Dr Ashby says that, of 265 cases treated at the Hospital for Sick Children at Manchester, the mortality was nearly 8 per cent.[‡] Meigs and Pepper found it only 5 to 10 per cent.[§]

Complications and Sequelæ.—These are important in children. Dr Clifford Allbutt has pointed out that the mesenteric glands are often so injured by typhoid fever that nutrition is very much impaired, and it is under these circumstances that tuberculosis is apt to show itself, whilst the period of convalescence renders the constitution liable to measles, scarlatina and whooping-cough. Diarrhœa from unhealed ulcers may occur, leading to peritonitis and perforation of the bowels. Bronchitis, pneumonia, and pleurisy may follow. Dr Wilks relates a case of general emphysema in a boy, occurring on the twelfth day of typhoid fever. It was ascertained after death that air had escaped through a sloughing ulcer of the larynx.[‖] Want of memory and various kinds of delusion have ensued.[¶] Trousseau mentions tubercular meningitis.[**] Chorea sometimes occurs, and according to Murchison incontinence of urine and otorrhœa are common in children.[††]

The *morbid appearances*, when the disease ends fatally, are chiefly seen at the lower end of the ileum, the most extensive mischief being found near the ileo-cæcal valve, where there is shown a tendency to destruction of the mucous membrane, and ulceration or even sloughing, or perforation of the peritoneal coat. When death takes place from perforation, and fatal peritonitis follows, pus and lymph may be found in the abdominal cavity. A rare case of the kind is related in a child 9½ years of age. "The small intestines were matted together by soft yellow lymph, which lined also the pelvic cavity, and coated all the contained organs; this lymph also extended upwards to the spleen, stomach, and under surface of the left side of the diaphragm; in this manner an irregular cavity, coated by recent lymph, and containing a purulent fluid, was found. A very complete layer of lymph also lined the pleural surface of the left diaphragm."[*] The glands of Peyer's patches, in severe cases, take on the appearance of vesicles or pustules, and subsequently they burst and produce an ulcer with oval or irregular outline, having thin and undermined edges. In some cases they escape ulceration altogether. The ileum is the chosen seat of these ulcers, but they may be seen scattered through all parts of the intestine, large as well as small. It is common to meet with enlargement and softening of the mesenteric glands, and in severe and rare instances they may take on suppuration. The spleen is often found enlarged, dark, and softened. The lungs are frequently more or less congested and hepatised. A variable quantity of intracranial fluid is frequently met with in the lateral ventricles and base of the brain, but neither this nor the vascularity of the brain and membranes are any evidence of inflammation, and bear no relation to the cerebral symptoms during life.

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[*] 'Diseases of Children,' 1853, vol. ii, p. 691.

[†] 'Treatise on Continued Fevers,' 1862, p. 501.

[‡] "Notes on Typhoid Fever in Children," 'Practitioner,' June, 1881, p. 401.

[§] 'Diseases of Children,' 1874, p. 832.

[‖] 'Trans. Path. Soc.,' vol. ix, p. 34; vol. xi, p. 14.

[¶] Murchison, op. cit., p. 505.

[**] 'L'Union Méd.,' aôut 6, 1859.

[††] Op. cit., p. 506.

Diagnosis.—The cerebral complications of typhoid fever in children are most important.[†] Like the bowels and the lungs, the brain is liable to be attacked in the course of typhoid fever, and young patients more than those of mature years are very prone to be carried off by coma or convulsions. The febrile process once established creates disturbance and excitement in the nervous system at a time when its active growth and rapid development are ill calculated to bear this extra strain. If simple inflammation of the brain comes on now and then in healthy children, I think it may occur during the progress of typhoid fever in rare and exceptional cases. The blood is changed, the nervous system is excited or depressed at one stage or another, and the functions of assimilation are perverted or destroyed, and effete matters from the decomposed tissues are not properly eliminated from the system. Setting aside the injurious effect which the circulation of poisoned blood at an elevated temperature must have on the nervous centres, there seems no satisfactory reason why the cerebral changes should be restricted to congestion of the vessels, or simple vascularity of the membranes.

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[*] "Two Fatal Cases of Typhoid Fever in Children," 'Brit. Med. Journ.,' 1882, vol. i, p. 775.

[†] See the abstract of a paper on this subject read before the Harveian Society by the Author. 'Brit. Med. Journ.,' Feb. 14, 1875, p. 122.

Now, it should be fully understood, and experience confirms the truth of the statement, that vascularity of the cerebral membranes is by no means infrequent in persons dying from typhoid fever where the brain has escaped altogether during the progress of the disease. If the lungs are involved, as they frequently are, and there is any amount of pneumonia, or interference with the pulmonary circulation; if the heart grows feeble, from increasing exhaustion of the patient, and its cavities become in any way oppressed, then congestion of the brain or its membranes will be frequently found after death; the cause has been mechanical, and we may term the condition one of "passive congestion." No relation can be established between the cerebral symptoms and the amount of vascularity which the membranes of the brain reveal. If we judge from the character of the delirium, or the convulsions, and the general insensibility of the patient, that these symptoms indicate excessive congestion, or inflammatory action, we shall be deceived, and errors of diagnosis will certainly lead us into errors of practice.

The diagnosis from *typhus* is to be sought for in the appearance of the fever spots, which in the latter disease, vary in colour from a pale dirty pink to a reddish brown or livid hue.* In typhus the eruption on the face in children is sometimes so copious as to resemble measles, hence the term "measly."† Diarrhœa as a diagnostic sign is of little value, since it may be present in typhus; but if it coexist with tympanites, and there is pain in the right iliac fossa, and the motions are of a yellow-ochrey colour, the disease must be put down to typhoid. The diagnosis would be strengthened by the occurrence of epistaxis or intestinal hæmorrhage.

The diagnosis of *meningitis* from typhoid fever, at an early period, is sometimes impossible. At the beginning of the fever, vomiting and cerebral symptoms may lead to the inference that the brain is primarily at fault. The drowsiness of fever is extreme sometimes, and if there be constipation also, we may easily be mistaken in fixing on the true seat of mischief. But soon the vomiting ceases, and by the second or third day the peculiar aspect of fever is recognised, and the child sinks into a state of stupor or indifference. The approach of meningitis is slower and more insidious than typhoid fever; the symptoms are less severe, and at an early stage it very rarely presents the high temperature of the latter affection. This is a diagnostic sign of great value. The insensibility of fever is not generally so profound as that met with in brain affections, and we do not as a rule witness the strabismus and irregularity of the pupils, nor the screwing up of the eyelids as in cerebral disease.

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* 'On Continued Fevers,' by Dr Murchison, 1862, p. 127.

† "On Typhus Fever," by G. Buchanan, M.D., 'Reynolds's System of Med.,' vol. i, p. 423.

We cannot, therefore, invariably separate typhoid fever in young children, characterised by a distinctly remittent type, from cerebral meningitis, especially when the child is under five years of age. The symptoms of one disease or the other must predominate before we can decide with which we are dealing. Usually the bowels are constipated in the cerebral disorder, and vomiting comes on without cause, whether the stomach contains food or not; the belly is normal or retracted, the pulse less frequent, and liable to irregularity in force and frequency. Above all, the temperature in meningitis is generally elevated towards the decline of the complaint, and only runs high at an early period in exceptional cases. The ophthalmoscope is another aid to diagnosis in obscure cases.*

If the symptoms are mixed together in various degrees, and there is irritation of the digestive organs, and cerebral congestion or inflammation, then, if with severe diarrhœa there are thin ochrey, and slimy stools, heat of skin, loss of appetite, thirst, and flushed countenance, we say this is a case of fever; but if there supervene in a few days, uneasy gestures, strabismus, loss of consciousness, picking of the lips and nose, retching or vomiting, then we infer the brain has been attacked in the course of the fever, and the symptoms are the result of exhaustion or over-excitement.

Our *diagnosis* must mainly rest on the order in which these symptoms have occurred. We must not dwell too much on the fever process, and set down the vomiting and cerebral symptoms to gastric disturbance, whilst the brain has been slowly and imperceptibly going wrong, and is, perhaps, the chief source of trouble.

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* See Chap. XLI, "Diseases of the Brain—Simple Meningitis and Tubercular Meningitis."

If the physician is called to see the case early, and an exact account of the mode of invasion has been furnished, his judgment will seldom lead him wrong, if he carefully weighs the evidence on both sides, and notes the absence or prevalence of fever in the same house.

Acute phthisis or tuberculosis may be mistaken for typhoid fever. A quick pulse, hurried respiration, circumscribed flushing of the cheeks, emaciation, delirium, mucous râles in the chest, and high temperature are common to both affections. But in phthisis, the belly is concave or depressed as a rule, and not distended and tympanitic as it is in fever.*

Treatment.—During the gradual approach of the disease, when there is thirst and loss of appetite, the child must not be tempted to take food which it cannot digest. A little milk and water, thin arrowroot, and tea with milk, are the only forms of nourishment required. Thirst should be relieved by frequent draughts of cold water, or toast-and-water, about a tablespoonful at a time, and a simple saline mixture of citrate of potash, or a mixture of nitrate of potash with a few grains of sulphate of magnesia, if the bowels are confined (Form. 8). For the first few days scarcely anything but cold water is required. No sort of fruit should be allowed. If the secretions are dark and offensive, an alterative powder of hydrargyrum cum creta, with a few grains of rhubarb, or even castor oil, should there be discomfort or pain in the abdomen. When there is tenderness of the abdomen, a warm poultice is comforting; and if there is pain, Dr West recommends a few leeches, which I have never found necessary, and I should try other means before resorting to them. The excitement and restlessness at night may be greatly relieved by bromide of potassium alone, or in combination with hydrate of chloral. They have proved of such value in my hands in all cases of wakefulness from nervous exhaustion that I recognise them as valuable calmatives in fever. Dr West speaks highly of a combination of tartar emetic and opium. He recommends a draught containing five minims of laudanum and a quarter or a third of a grain of tartar emetic, as a suitable anodyne for a child of five years old, and says it may be repeated night after night with almost magical effect.† One drop of laudanum, or something less, for each year of the child's age, in restlessness and excitement, will often induce refreshing sleep; and it may be repeated, should circumstances appear to demand it, without giving rise to any bad effects. If there be much heat of scalp, and the vessels about the temples are full, and the conjunctivæ injected; if the delirium is wild and the excitement fierce, then we ought to shave the head and apply four or five leeches. These symptoms often succumb to the local abstraction of blood, and life has thus in many cases been saved. The head symptoms that occasionally supervene in an advanced stage of the disease are very ominous, and require counter-irritation; they are often attended with squinting, and there is some amount of obscure meningitis with effusion, which may ultimately terminate in acute hydrocephalus.

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* See Chaps XXXVIII—IX, "On Tuberculosis" and "On Phthisis Pulmonalis."

† 'Diseases of Children,' 1859.

The temperature of the room should not exceed 65°, and all unnecessary articles of furniture and luxury should be removed; the clothing should be light.

Salicylate of Soda may be ranked among the first and quickly acting remedies for lowering the temperature. In many febrile states in children before it has been possible to make a diagnosis we may look upon it as a valuable therapeutic agent. I have seldom been disappointed with it in uncomplicated cases where there is no great depression. The doses should vary from five to ten grains every three or four hours for a child from five to ten years of age. (*Vide* Form. 87—90.)

Cold Bathing.—By this means we have the power to prevent an undue rise of temperature, and, in this way, of obviating much local and constitutional disturbance. By its employment the pulse and respiration are reduced in frequency, headache and delirium are controlled, the prostration is lessened, the tongue becomes moist instead of brown, and thirst diminishes. This treatment is not by any means novel, and has been occasionally resorted to in fever since the beginning of this century. It has, however, of late years received more attention, owing to its influence in controlling the hyperpyrexia of acute rheumatism, and some other diseases which defy the action of all known drugs.* There are various modes of applying cold, but the graduated bath is the best and easiest. The bath should be warm at first, and then cooled down to the required temperature by the addition of cold water or ice. "This must be regulated according to the patient's condition and the effect we wish to produce. As a rule it should not exceed 70° Fahr., and may often be advantageously much lower; 65° to 70° may be taken as the average limits. The duration of the bath must also be regulated by the patient's condition, and the effect it produces. We ought to cause a reduction of at least two or three degrees, and if this is not obtained the next bath must be colder or longer. It must be remembered that the temperature usually continues to fall for some time after removal from the bath, and it is, therefore, not necessary to take the temperature in the bath itself, but it should be done about half an hour after. The bath should be prolonged for some little time after distinct shivering has begun, watching, of course, the effect on the circulation. Usually the bath will be well borne for from ten to twenty minutes. The patient should then be put to bed, wiped dry, and covered with a blanket. In many cases it is advisable to give some brandy or other stimulant before or during the bath."[*] [†] The number of baths required will depend upon the severity of the case, and the effect produced upon the nervous system.

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* See Chap. XLVIII.

When the pyrexia is high, and it is not considered advisable to employ the bath, sponging with cold water at a temperature of 50°, or even lower, will cool the system and refresh the patient. The arms and legs should be quickly sponged, and afterwards dried with a towel; then the chest and abdomen are to be treated in a similar manner, and the process is to be repeated as often as it may appear necessary. In this way the temperature may be generally lowered several degrees without fatiguing the patient, but if it should fail, the graduated bath must be resorted to.

Cold bathing is not contra-indicated when there is pneumonia or bronchitis, complications which are produced by the action of the fever poison itself, but in cases where the lungs are congested from chronic bronchitis, or cardiac disease, it should not be attempted, nor must it be employed in cases of intestinal hæmorrhage and peritonitis, because the parts cannot be kept at rest, which is so important.

During the second week when the vital powers require support, beef tea, veal or chicken broth will be needed. If there is diarrhœa milk, arrowroot, and rice water flavoured with cinnamon must be substituted for animal broths. Beef tea thickened with arrowroot was insisted on by Dr Murchison as an excellent form of nourishment in typhoid fever.[*] Milk is apt to be overrated in fever, for, where the bowels are loose and irritable, and the stomach is weak, as we expect to find it in the first week or two of the fever, the milk is too heavy to be digested, and the curd, acting as an irritant when the fluid portion is absorbed, provokes diarrhœa, and even keeps it up if present. It should therefore be diluted with seltzer water, or lime water, and in many cases it may be replaced by beef tea, or, what is better, barley water, beef tea being apt to induce and keep up purging. When diarrhœa is troublesome, a grain or two of Dover's powder at bedtime, or a starch enema with a few drops of opium, or bismuth will check the irritation. A grain of acetate of lead with acetic acid every three or four hours is sometimes of service (Form. 29). A mixture containing rhatany root[†] is an excellent remedy after each evacuation, and the child may be allowed a little port wine in arrowroot. Whilst there is diarrhœa the patient should remain in bed. Local applications are not to be forgotten when there is diarrhœa, and tenderness of the abdomen. Fomentations are comforting, but more benefit is derived from a warm light linseed poultice frequently changed, or a piece of spongio-piline, or flannel wrung out in hot water, and sprinkled with turpentine, or some stimulating liniment.

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[*] Cayley, 'On Typhoid Fever,' 1880, p. 99.

[†] "The Antipyretic Treatment of Typhoid Fever." By Drs Coupland, Cayley, Bristowe, and Frederick Taylor. Med. Soc. Lond., Feb. 18—24, 1884.

In hæmorrhage from the bowels, ice to the abdomen, and gallic acid or turpentine by the mouth, has been given successfully in some cases.

As long as there is febrile disturbance, no solid food should be ordered. This may be formulated in the following rule—no solid food should be allowed till the evening temperature has been down to normal for three days.

Stimulants are not often required for children under ten years of age, if they can digest sufficient nourishment, but cases occasionally occur where life has been saved by a free exhibition of them. A teaspoonful of brandy every three or four hours, in water or thin arrowroot will restore the tone of the nervous system, and support the faltering circulation. Alcohol proves serviceable by dilating the cutaneous capillaries, and encouraging perspiration.

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[*] Op. cit., p. 566.

[†] Form. 4:

℞ Tinct. Krameriæ ʒiij
Liquor. Opii Sed. ♏xij
Spt. Chloroform. ♏xx
Syr. Zingiberis ʒss
Aquam ad ℥iv. M.

A dessert-spoonful after each action of the bowels.

In the shape of medicine, a few drops of dilute hydrochloric acid with spirit of chloroform, as in the case of adults, will be useful* if there is no abdominal pain or discomfort; but in many cases medicines are unnecessary. In low febrile conditions, especially if the disease is remittent in character, where there is no diarrhœa, quinine with phosphoric acid is an excellent measure.† Steel is also of service where convalescence is slow.

During the cicatrization of any ulcers that may have formed when convalescence is established, the use of aperients and improper food may lead to the most disastrous consequences. Nothing stronger than a dose of castor oil, or a simple enema, ought to be employed to open the bowels. Boiled sole or whiting should be given for some days before meat.

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* Form. 5:
℞ Acid. Hydrochl. Dil. ♏xl
Spt. Chloroform. ♏xx
Syr. Rosæ ℥ss
Aquam ad ℥iv.
M. A dessert-spoonful every four hours.

† Form. 6:
℞ Quiniæ Sulph. gr. iv
Acid. Phosph. Dil. ʒj
Syrupi ℥ss
Aquam ad ℥iv.
M. A dessert-spoonful three or four times a day.

For children from five to eight years of age.

CHAPTER VII

SPECIAL ERUPTIVE FEVERS

Their classification and general symptoms—Vaccinia—Varicella—Character of the eruption—Diagnosis from smallpox—Treatment—Gangrenous eruptions.

THE special eruptive fevers of childhood are Vaccinia, or Cow-pox; Varicella, or Chicken-pox; Variola, or Smallpox; Rubeola, or Measles; Scarlatina, or Scarlet fever. They are all due to the reception of a poison into the system, which, after a variable period, sets up tolerably uniform constitutional symptoms. There are shivering and rigors, or even convulsions, cold along the spine, loss of appetite, headache, languor and disturbed sleep; then reaction comes on, followed by fever, heat of skin, and the specific eruption. These are the chief symptoms which mark the onset of the exanthemata. They often prevail as epidemics, and these present very opposite characters in the degree of vascular action, and the power of resistance. Though some epidemics are mild, they are as a rule more severe than those of sporadic occurrence, and the severity of the attacks and their complications depend on age and constitution; upon hygienic conditions, and the season of the year. If the health is lowered by previous illness they attain greater force, and the mode of early treatment may determine the result. They pursue a determined course, and active interference is sometimes more injurious than when the unaided powers of nature are left alone, for in this way it is possible to invite various affections more dangerous than the original malady. The exanthemata generally attack persons only once in life, and that at an early period. Scarlet fever is the most likely of these diseases to happen a second time. Smallpox and measles may be united in the same individual; and a severe attack of hooping-cough may set in before the latter has departed.

Vaccinia, Cow-pox, or Vaccination.—The virus of cow-pox when introduced into the system produces a specific disease, only modified by its passage through the cow, or one of the lower animals. Vaccination so induced, is protective against variola or smallpox. Cow-pox is a vesicular disease, occurring chiefly on the teats and udders of cows; it is natural to them, and as a disease of spontaneous origin, occurs almost exclusively to the milch cow, and follows a uniform and definite course. About the fourth day of invasion a few red and tender pustules appear on the teats and udder, which change into vesicles, and pass through the same stages as in man. From the friction used in milking, the vesicles burst, and the lymph which exudes sets up similar sores on the milker's hands, and in this way the disease is conveyed to other animals in the dairy who were previously well and healthy.

After successful vaccination there is nothing certain to be observed till the third day, when a small red nodule is noticed; on the fifth day an oval or circular vesicle is seen, depressed in the centre, and containing a little lymph. There may be as many spots as punctures a day or two before, but in many cases we cannot say they are due to the virus. On the eighth day the vesicle is increased and threatens to burst, the centre is depressed, and there is a large quantity of transparent fluid. The vesicle is at its highest state of perfection; the skin for some distance around it is inflamed of a rosy hue, and the subjacent areolar tissue is hard, tender, and painful. On the tenth or the eleventh day the areola has extended, and the greater part of the arm may be erythematous. If the vesicle has not been opened it now bursts, and the centre dries into a hard dark scab, and falls off about the twenty-first day, leaving a deep circular depression or cicatrix, with several pits or dots, having a whitish or more pearly look than the rest of the arm. In children who are young and of full habit an eruption of roseola sometimes takes place on the body and extremities, having a papular or vesicular appearance; it occurs about the ninth or tenth day, and lasts about a week. Vaccination does not follow the same course in all cases, the vesicle being developed earlier in some cases than in others, and instances of retarded cow-pox are sometimes met with, particularly when dry lymph is employed. When the health is good, children should be vaccinated early, but when they are delicate it should be postponed till they are stronger. One fourth of the deaths from smallpox in England occurs under the age of one year. Of 42,277 deaths from smallpox which occurred in England in the ten years 1856-65, 10,223 were in children under one year of age."*

There is no exact rule to go by as to the time of taking the lymph, as the vesicle varies in its progress to perfection, but it should not be taken later than the eighth day; sometimes it is ripe on the fifth or sixth day, and this happens when the arm has become inflamed from the moment of inserting the vaccine.

In vaccinating children some precautions are necessary to be observed. No child who is out of health, or has recently had scarlatina or measles, or has a chronic skin eruption, should be vaccinated. If boils or a pustular eruption follow vaccination they will demand alterative medicine, tonics, and good air. These sequelæ are occasionally intractable, and the ulceration on the arm may prove most rebellious to treatment. I have often witnessed the inflammation so great, as to require the constant application of lead lotion under oil-silk, or warm fomentations. Wasting of the deltoid, and paralysis of the arm, followed vaccination in a case I saw in 1873. Sloughing and protracted ulceration of the shoulder ensued in the case of a child, four months old, brought to me in June, 1880, and in the spring of the present year an irregular ulcer on the site of five of the vesicles following vaccination. There was also fluctuation over the left internal malleolus. The child died from blood-poisoning and a post-mortem examination revealed abscess in the lungs, liver, and peritoneum.

I am not an advocate for vaccinating children before the third month, but it is done by some medical men as early as the sixth week.

I prefer vaccination from arm to arm, but where this cannot be done, the vesicle should be punctured with a lancet, and the lymph collected in an open capillary tube, drawn up by capillary attraction. One end of the tube must be placed within the vesicle, taking care to avoid contact with the blood or pus. When it is full, the ends of the tube are to be closed by holding them in the flame of a spirit-lamp or candle.

In deciding upon the spot for vaccination, the arm just below the shoulder is usually selected, and there is no better, for the part is hidden by the dress of women whether high or low dresses are fashionable. If there should be a growing nævus, or other ugly mark on the skin, it may be selected as a fitting spot for the operation, and in many cases it lessens the disfigurement, or destroys it altogether.

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* "Vaccination," by Dr. Seaton, 'Reynolds's System of Medicine,' 1876, vol. i, p. 280.

Varicella or Chicken-pox.—This disease has also received the name of swine-pox or bastard-pox. It is both contagious and infectious, and the eruption consists of small vesicles about the size of a hemp-seed, which never become pustular. It was formerly confounded with smallpox, just as smallpox and measles were mixed up together and not recognised as distinct diseases. It is a disease of childhood and has never been known to occur a second time. The period of incubation usually lasts from ten to twelve days. Some authorities make it longer.* In the incubation stage there is sometimes slight elevation of temperature, and when a copious eruption has been developed, it may reach 101·5°, or even 104·0°. It seldom exceeds this (Wunderlich). The disease ends without any ill consequences, in the course of four or five days. The child is poorly and off his appetite; there is lassitude and flying pains about the limbs, and the sleep is disturbed. Small red pimples appear which change into vesicles containing a thin transparent fluid, or slightly turbid serum. On the third day they mature and burst, and dry up on the fifth without leaving any mark as in variola, or having an inflammatory areola. The eruption comes out irregularly and new vesicles may be seen just making their appearance as the old crop are fading away. It is first observed on the body and back, then extends to the face and scalp, and lastly is seen scattered over the extremities. When the vesicles are pricked they collapse, and there is no swelling or distinct elevation of the skin. Children of all ages are liable to the complaint, but it is not so common after the seventh year. It cannot be communicated by inoculation; it is no protection against smallpox, and vaccination has no power to prevent the disease.

The *diagnosis* from modified smallpox rests on the fact that the eruption of varicella is most marked on the back, the face often entirely escaping, and that owing to the eruption coming out in an irregular manner, all stages may be met with at the same place on the same day, whereas in smallpox, the rash is either all papular, vesicular or pustular.

The *treatment* required, is confinement to bed, a light fluid diet, and a saline aperient. If any of the vesicles are umbilicated, and likely to leave a scar on the face, they may be touched with collodion. For any subsequent weakness that remains during convalescence, a little quinine, or the syrup of the iodide of iron will be found necessary.

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* "Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases," by Charles Murchison, M.D.—'Clin. Trans.,' 1878, p. 240.

Mr Jonathan Hutchinson has called attention to "Gangrenous Eruptions in connection with Vaccination and Chicken-pox."* In one case which came under his notice, death followed from a gangrenous eruption, thirty days after vaccination, in an infant three months old. The vaccinifer was in perfect health, and in four other children who were vaccinated from the same source, nothing unusual happened. On the face, scalp, and trunk, there were spots and patches varying in size from a shot to a shilling. The larger one showed a ring of deep ulceration, with a central slough of black skin. Mr Hutchinson states that "the primary lesion of the skin was a hard papule with an umbilicus closely resembling variola," for which disease it had been mistaken by the surgeon who saw the case. He has also recorded cases of "Varicella Gangrenosa." The spots of varicella develop into deep punched-out sores, in some cases as large as sixpences. The disease occurs both in healthy and feeble subjects. Mr Warrington Haward has given interesting details of a case, in a child a year old. The temperature reached 104°, and the child died on the fourth day from pyæmia. After death secondary abscesses were found in the lungs, and on the left side recent lymph, and purulent lymph were found in the pleural cavity.†

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* 'Med.-Chir. Trans.,' vol. lxv, p. 1.

† 'Brit. Med. Journ.,' 1883, vol. i, p. 904.

CHAPTER VIII

MORBILLI OR MEASLES*

VARIETIES OF MEASLES.—1. *Morbilli mitiores*—2. *Morbilli graviores*—3. *Morbilli sine catarrho*—*Symptoms of each form—Character of the eruption—Its lingering nature in some cases.*—MORTALITY, CAUSES, AND COMPLICATIONS—*Not always attributable to unhealthy localities—Frequency of bronchitis and pneumonia—Rapidity with which the lung becomes hepatised in some cases—Intestinal irritation and diarrhœa—False croup—Congestion of the brain—Convulsions—Pharyngitis and aphthous ulceration of mouth—Swelling of the cervical glands—Case in illustration*—SEQUELÆ—*Cancrum oris—Strumous ophthalmia and ulceration of the cornea—Otorrhœa—Suppuration of the cervical glands—Chronic diarrhœa—Phthisis.*—TREATMENT—*Importance of maintaining a warm temperature and good ventilation in the sick room—Utility of cupping where pulmonary engorgement and cerebral congestion are present—Value of stimulants in the typhoid stage of the disease—Bulimia.*

Measles is a more prevalent and contagious disorder than scarlet fever or smallpox, but it is less dangerous than either. The greatest proportion of children that fall victims to it are under the age of five years. In scarlet fever the same rule as to age applies, though not to the same extent. Although measles is essentially a disease of early life, it may occur almost at any age, and few persons at one time or another escape it, whilst scarlet fever frequently spares people altogether.

The period of incubation is much longer than in scarlatina, and extends from ten to fourteen days, during which time the patient is apparently quite well. The eruption generally appears on the fourth day of the fever. In my own family, three children, who were laid up with it at the same time, exhibited a short febrile stage, the eruption appearing on the second and third days of the fever, and cases are unquestionably to be met with where the catarrhal symptoms and the eruption are coincident.*

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* "Measles and scarlet fever were long regarded as varieties of smallpox. Measles was first distinguished from variola by Abu Dschafar, and other Arabian physicians in the twelfth century; but measles and scarlet fever continued to be looked upon as one disease, which was designated '*morbilli*.' An Italian physician, Philip Ingrassias, of Palermo, in the middle of the sixteenth century, first described scarlet fever, which he called '*rossalia*,' as distinct from morbilli or measles."—*Clinical Lectures on Medicine*, by Dr Murchison. A case of Rötheln, or German Measles.—'Lancet,' Oct. 29, 1870, p. 596.

Three varieties of measles are described:

1. *Morbilli mitiores.*
2. *Morbilli graviores.*
3. *Morbilli sine catarrho.*

1. *Morbilli.*—The disease sets in with symptoms resembling the approach of a severe cold, or with a convulsive seizure. These are pallor, loss of appetite, and shivering; the child is languid and heavy, and lolls where it can; headache, frequent pulse, drowsiness, and restless sleep, with wandering and screaming at night, are noticeable warnings. These symptoms are so severe in some children that it is difficult to prevent them from falling out of bed. The eyes are suffused and watery and the conjunctivæ injected in most cases; but this is not necessarily so, and the eyes in the worst forms may have a dull look and be free from irritation; or the lids may stick together, and the eyes remain closed during the activity of the eruptive stage. The mucous membrane of the nose and fauces is congested, and there is frequent sneezing; the cervical glands are felt to be enlarged. The skin is hot, and the temperature may run up to 104° or 105° in severe cases. It has been observed as high as 109° on the fourth day of the disease, and to fall four degrees in the course of the night. In ordinary cases the temperature will rarely be found to exceed 102°. The maximum of fever coincides with the height of eruption, which is reached by about the fifth day. It may continue from twelve to twenty-four hours, when it is succeeded by rapid defervescence. The normal temperature is reached on the second day from the beginning of the defervescence. In exceptional and very severe cases, the fall may be more protracted. The pulse may range from 140 to 160,

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* Some degree of confusion, and even error, are apt to arise in calculating the duration of the incubation period, some authorities reckoning from the time the poison is received into the system, and the first appearance of symptoms, whilst others calculate from the same period till the eruption shows itself. If the former method of calculation is adopted, it will reduce the incubation-period to ten or eleven days. *See* 'Clin. Trans.,' 1878, p. 228, "Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases." By Charles Murchison, M.D.

while the respiration is hurried and short. The bowels are generally costive, though there may be diarrhœa, and the urine is turbid and contains urates; the tongue is covered with a thick creamy fur, which shows points of redness as it is removed, and the whole may become red and moist by the eighth or tenth day from the commencement of the symptoms. Pharyngitis, pain in swallowing, thirst, and loss of voice are frequently present, and the irritation extending into the lungs causes loss of sleep and restlessness.[*] Remissions and exacerbations are common, as in some other diseases of children. Vomiting is occasionally present at the commencement of the disease, but it is far less frequent than in scarlet fever, and is not so generally confined to the early stages. In one case, however, a child fourteen months old vomited thirty times a day, and before the eruption appeared I dreaded some cerebral affection. The little patients may bring up bile from the violence of the retching, and epistaxis from the fulness of the nasal vessels is not unfrequently met with. There may be no thoracic complication in the shape of cough or bronchitis for the first two or three days of the eruption, but when it becomes more developed, and is raised above the skin in blotches, the cough is incessant and irritating, and both small and large crepitation are heard throughout the chest. The cough occurs in paroxysms, and is often short and barking; it is attended with tightness across the chest, and is worse at night. I have noticed the upper lobes of both lungs frequently attacked, and where the lower were not the first to show signs of mischief, and that, too, in cases which were not tuberculous. This is owing to the extension of the inflammation down the larynx and trachea to the bronchi.

The *eruption* first appears in minute red circular points or blotches, not unlike flea-bites; these coalesce and form irregular shaped or crescentic patches of a pinkish red or raspberry hue. The eruption becomes papular, and when at its height, sometimes vesicular on the neck and breast. When the rash is well developed, very little healthy skin intervenes. The chief seats of the eruption are the face, back, and loins. In one case under my care, the rash first seized the left cheek and neck, and twelve hours elapsed before it appeared on any other part. The eruption does not involve the whole body at one time ; it usually fixes upon the face and upper extremity first, then the trunk, and finally the lower extremity. The rash has been described as coming out in three crops, each crop lasting from three to four days. The interval between the crops is about twenty-four hours, but often much less. The first crop appears on the face, and then spreads to the neck, breast, and arms ; next day the second crop covers the trunk, and on the third day, the third crop appears on the lower extremities. Thus the whole body becomes covered with the eruption. When the eruption is at its height, and the bowels are free, the pulse usually begins to fall in frequency, and the temperature declines, but the symptoms do not generally decrease on the appearance of the eruption, they often increase, and the breathing becomes accelerated. In some cases there is only occasional loose cough, without any physical signs. The eruption, too, is variable. On the morning of the third day of the fever it may be copious on the face, and the papulæ may be distinct and elevated above the surface ; by the evening, the eruption may run together, and assume a large vermilion patch on the cheek. The constitutional symptoms run high with considerable fever, thirst, and wandering ; next day the eruption may assume a more purple hue, to be again followed by increasing brightness of colour. Sometimes it is confluent, resembling scarlet fever, and the spots are dark and purplish from rupture of the capillaries, and remain for a length of time, and do not disappear on pressure. The rash begins to fade as early as the fourth day, and from above downwards in the order in which it has first appeared. During the next two or three days the cuticle desquamates in furfuraceous scales. About this time diarrhœa is not uncommon, and if the weather is cold and great precautions are not observed, capillary bronchitis or pneumonia may supervene. If on the seventh day of the fever there is an increase of temperature, and the pulse and respiration are also more frequent, we may reasonably take alarm, because the symptoms have become aggravated at a time when they ought to be better. In such cases I have known the eruption copious and dusky, with the features swelled, and the lips dry : in a case under my care, in 1880, there was albumen in the urine from renal congestion, wandering at night, and diffused bronchitis.

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[*] A delicate boy, aged six years, came under my care in March, 1877, and on the fourth day of the fever the temperature was 104·8°, pulse 176, respirations 28; on the seventh day, when the eruption could scarcely be defined, the temperature reached 105°, pulse 200 running, respirations 60; there were extensive râles through the front and back of the chest, yet the urine was copious, clear, acid, specific gravity 1022, and at no time of the illness did it throw down the slightest deposit, or deviate from health. As an instance of rapid recovery and convalescence, this little boy, who was near death on the 28th of March, and in a critical state for a week after, was running about the ward with scarcely any trace of catarrh on the 11th of April.

2. *Morbilli graviores—Malignant measles.*—The symptoms here are more severe from the first; the eruption comes out irregularly, lasts longer, and has a dark claret hue, which has received the name of black measles. It is slightly raised above the skin, and has the appearance of petechiæ. Some authorities do not consider this a distinct species, holding that the darker colour of the eruption is due to imperfect decarbonisation of the blood from pulmonary complication. The disease beginning as morbilli mitiores may pass into this grave variety. The constitutional symptoms are of a typhoid character, the pulse is frequent and small, the aspect heavy and bloated; the tongue is dry and glazed in the centre, and sordes collect on the teeth; the motions are dark and putrid, or there is severe diarrhœa. The lungs are early involved in capillary bronchitis or pneumonia, and death takes place in many instances by asphyxia or coma. There is dry and constant cough, and the child is drowsy and indifferent. Râles are heard over the posterior surface of the lungs, and air enters them imperfectly. I have known them so loud, and the mucus so great in the tubes, as to give rise to physical signs bearing a close resemblance to the gurgling of a cavity, and yet in a week after, the whole lung has been resonant, while scarcely a trace of bronchial irritation remained. The blood in these cases is dark and fluid, and the fibrine and solid parts are deficient.

It is an unfavorable sign when from debility or other causes the eruption is sluggish in coming out, or it suddenly disappears. Some serious complication is apt to arise in such cases, as diarrhœa, coma, or convulsions. The pulse becomes weak, small, and frequent; the eruption irregular and dark from hæmorrhage into the cutis; the body is intensely hot and the temperature very high, whilst the feet and hands are cold. The tongue becomes dry, the mind wanders, and the patient may sink from exhaustion or convulsions.

3. *Morbilli sine catarrho.*—This is by some regarded as merely a mild form of measles without the occurrence of pulmonary symptoms; just as there are also cases in which the eruption fails to come out, and which, with all the other symptoms marked, must be classed as irregular forms of measles. The fact is, however, many cases of so-called morbilli sine catarrho, are really cases of Rötheln, or nothing more than varieties of erythema.

The mortality of measles is estimated at 1·15 per cent., but the fluctuation is considerable from year to year. It is essentially a disease of early life, for it seldom recurs, and, unlike scarlet fever, the deaths appear to be greatest between one and two years of age. After the age of five years the mortality undergoes great diminution. The returns of the Registrar-General give the greatest number of deaths before the completion of the first year; the absolute mortality is greatest among male children, but as more boys are born than girls, the proportional death-rate is almost equal in both sexes.

Causes.—The disease is due to a specific poison, and it may be inoculated by the blood of a person suffering from it, or the secretion from the nose and air passages.[*] The poison is more powerful in some epidemics than in others, which is perhaps due to atmospheric changes; those in the winter months are proverbially more severe than those in the summer months from the liability to more pulmonary mischief. The cause of death among the poor is in many instances pneumonia, brought on by want and exposure, and inattention to temperature. An epidemic does not always seize upon unhealthy localities where dirt and destitution abound, or where the water supply is deficient, but where unrestrained intercourse is permitted to take place between healthy and diseased children.[†]

The chief complications of measles are bronchitis and pneumonia, and these most frequently commence in the first stage of the disease when the eruption is at its height; or when the patient has suffered exposure to cold; or in its decline, even when the most assiduous precautions have been followed. When it does arise during the first four or five days of the fever, the rash often disappears, and the pulmonary symptoms proceed to a fatal termination. The lung speedily runs into hepatization, and there may be scarcely any cough to direct our attention to it. Wherever there is any thoracic mischief the chest should be examined at each visit, for the slight bronchitis which almost invariably accompanies measles may creep down into the air passages, and extend to the smaller bronchial tubes and the vesicular tissue of the lungs. The occasional absence of cough and dyspnœa should not mislead us, when we remember how much the thoracic organs may be involved with little disturbance of their functions. But broncho-pneumonia, implicating the minute structure of the lungs, will soon cause acceleration of the pulse, and produce some lividity of the features. When these symptoms are present it would be inexcusable to overlook the physical examination of the chest.

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[*] Drs Braidwood and Vacher, of Birkenhead, have found that glycerine breathed on by a patient suffering from measles during any of the eruptive days, exhibited numerous spherical sparkling bodies, like those found in vaccine, but larger, and others elongated, with sharp cut ends sparkling and colourless. Such particles were not found in glycerine breathed on by healthy children, nor even by those suffering from scarlatina or typhus.—*Trans. Path. Soc.*, vol. xxix, p. 422.

[†] "Outbreak of Measles," 'Brit. Med. Journal,' Dec. 1, 1867, p. 574.

Another complication of measles during its progress is an attack of colitis, in which the motions contain mucus and blood, accompanied by pain and drawing up of the extremities. The solitary glands are inflamed and tumefied, a condition which may run on to superficial or deep-seated ulceration, and the child may perish from diarrhœa and exhaustion. If it occurs after the eruptive stage in the decline of the complaint, it is more difficult to arrest, and may cause death after some weeks. Thus the same tendency to irritation of the pulmonary mucous membrane is apt to extend itself to the intestinal canal, and if, from constitutional weakness, the child's strength is greatly reduced by a slow and imperfect recovery, then phthisis may supervene after many weeks or months.

Croup is another disease which occurs as a complication of measles. A case is recorded by Mr Royes Bell, of a boy, seven years of age, in which there occurred on the second day of eruption a croupy cough. The paroxysms of suffocation became so frequent that tracheotomy was performed, but the child died of ulceration of the trachea fifteen days after.* From my own observation I should say that inflammatory croup or catarrhal laryngitis was not uncommon. It is characterised by soreness of the larynx, and a loud, shrill, ringing cough. The child may cough up a little thin phlegm, but no false membrane is ever formed as in membranous laryngitis. The aspect is never so distressed or anxious, nor is the voice so subdued, or the cough so hoarse. If diphtheria is epidemic when measles prevails, it is a frequent complication. The mucous membrane of the mouth and pharynx sometimes takes on an aphthous and ulcerated condition about the eighth day, when the decline of measles is ordinarily looked for. In 1877, I saw a male child, eighteen months old, who on the seventh day of measles was seized with swelling of the cervical glands on both sides, so as to obliterate the rami of the jaw. The following day the mucous membrane of the cheek, pharynx, and tonsils was covered with a yellowish fibrinous exudation, which was firmly adherent in some places, but easily separated in others. The temperature rose to 104·8°, the pulse to 180, and the respirations to 50. The child became extremely exhausted, but recovered in a month. The treatment consisted in the use of the carbolic acid spray, and the internal exhibition of iron, chlorate of potash, strong beef tea, milk, &c.

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* "Case of Measles complicated with Croup." 'The Lancet,' vol. i, 1879, p. 295.

In three or four instances of my own experience, congestion of the brain, and effusion into the ventricles and base of the brain, carried the children off. Convulsions are another complication.

In the summer of 1884, I saw with Mr Times, of Manchester Street, a little boy, four years of age, who was suffering from acute desquamative nephritis, congestion of the lungs, and anasarca. The urine was almost solid on boiling. Three weeks previously he had an attack of measles, from which he apparently made a good recovery.

Among the *sequelæ* are cancrum oris, and a severe and troublesome form of strumous ophthalmia, leading in many cases to ulceration of the corneæ and permanent damage of the organs of vision. Otorrhœa is another common affection, so is suppuration of the cervical glands; chronic diarrhœa, phthisis, croup, and enlargement of the mesenteric glands are also among the consequences of the disease. When whooping cough follows, it has probably been contracted beforehand.

Except in the malignant form, measles may be considered a favorable disease, if the febrile symptoms are moderate, and the eruption comes out well. Notwithstanding the activity of the eruption, however, it is to be viewed with apprehension if the skin is hot and dry, and the respiration hurried. If the fever increases after the appearance of the rash, and the pulse becomes quick and small, the patient's condition is alarming; and if pneumonia or whooping cough, or constant diarrhœa be present, the danger is proportionately greater.

Treatment.—The room should be kept dark, and the temperature not less than 60°. A current of fresh air is important, but all draughts should be carefully excluded. In mild cases it is only necessary to confine the patient to bed, and to maintain warmth and a gentle action of the bowels. Attention to cleanliness must be observed. For the first three or four days the diet should consist of gruel, milk-and-water, thin beef tea, or chicken broth. Barley-water flavoured with lemon, linseed tea, and the inhalation of steam will be grateful to the sore and inflamed mucous membrane. If the febrile symptoms are considerable, a diaphoretic mixture* with a little antimonial wine every four hours, or a saline aperient,[*] will be necessary to encourage the action of the skin and bowels. Sometimes a warm bath, if the skin is dry, to promote perspiration, will be found serviceable. When symptoms of exhaustion are threatening, the carbonate of ammonia, with a little spirit of nitrous ether, may be given, and alcoholic stimulants, if they seem to be demanded, such as brandy or sherry beaten up with egg. Raw beef juice has proved useful in cases that at one period of the illness appeared hopeless. If the cough is very troublesome, and the patient can obtain no rest at night, a little ipecacuanha wine with morphia, or the compound tincture of camphor, may be prescribed when the lungs are not overloaded with mucus (Form. 77). Hydrate of chloral, with syrup of tolu, or these combined with bromide of potassium, will allay excitability and promote sleep, whilst a warm bath is soothing and hastens the process of desquamation.

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* Form. 7:

℞ Liquor. Amm. Acet. ℥j
Vin. Antim. ♏xl
Syr. Tolutani ʒiij
Aquam ad ℥iv.

M. A tablespoonful every four hours.
For a child five or six years old.

When the pulmonary symptoms are severe, and there is drowsiness, blood should not be taken from the arm, but cupping between the scapulæ may be resorted to, if the pulse is small, firm, and hard, and the rash well out. After this, the air will enter the lungs more freely, and the duskiness of the eruption will be exchanged for a more general redness. As the inflammation is caused by a morbid poison and runs a definite course, we must be content to watch the symptoms, and expect their subsidence as the eruption disappears. In the malignant form of the disease, where there is a typhoid condition, the strength must be supported from the first, and eggs, beef tea, milk, coffee, &c., must be regularly given. Brandy or wine should be mixed with an egg or milk, and given, notwithstanding any delirium that may be present. If the breathing is hurried, or there is dulness or crepitation in the lungs, and especially if there is any difficulty in expectoration, carbonate of ammonia, spirit of chloroform, and senega will be necessary (Form. 69, 70). If the eruption is dusky, or disappears too suddenly, and there is any oppression in breathing, mustard poultices should be applied to the chest, the feet plunged into warm water, and wine and diffusible stimulants freely given.

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[*] Form. 8:
℞ Magnes. Sulph. gr. xl
Potass. Nitrat. ʒss
Syr. Limonum
vel. Syr. Tolut. ʒiij
Aquam ad ℥iv.
M. A tablespoonful every four hours.
For a child five or six years old.

If convulsions occur, a warm bath or foot bath is advisable, and if they do not yield to these remedies, three or four leeches may be applied to the temples. Diarrhœa should not be hastily checked.

When the child begins to recover, and during convalescence, it cannot be too much insisted on that all chance of cold should be carefully avoided, as neglect of this rule may, by weakening the general health, invite some of the troublesome sequelæ we have alluded to, and among them tuberculosis; for measles seems to have the power of especially rousing into activity the various forms of scrofulous disease. Warm clothing and flannel worn next the skin are most important, and sea bathing and cold sponging are very valuable, if used in proportion to the strength and constitution of the child.

When measles has been severe, and has reduced the general strength by causing some degree of subacute pneumonia, or chronic intestinal disorder, it is sometimes followed by a voracious appetite, and a sensation of hunger approaching to bulimia. This is also noticeable as a sequel to some other diseases of children where digestion is imperfectly performed, and the absorption of the chyle does not ensue owing to disease of the mesenteric glands. If, because of this insatiable appetite, food is injudiciously given, the digestive organs are never rested, but grow weaker and weaker, whilst the body slowly wastes. In these cases the complexion is wan and pale, and nothing does any real good. The tongue is commonly covered with a light fur in the centre, and the papillæ are prominent, the epithelium peels off in places and it presents a sore and ragged appearance. These children swallow their food as soon as it is in their mouths, and thus overtax the feeble mucous membrane. The rational treatment consists in restraining the child's consumption of food, and giving at first an exclusively milk diet, and later on, beef tea, eggs, &c. Medicinally, a few grains of chlorate of potash, with dilute hydrochloric acid, will be useful.* Quinine, steel wine, and, above all, cod-liver oil will be found of the greatest service during convalescence.

Form. 9:

℞ Potass. Chlorat. gr. xx
Acid. Hydrochl. Dil. ♏xl
Syr. Hemidesmi ʒss
Aquam ad ʒiv.

} M. A tablespoonful three times a day.
For a child five years old.

RÖTHELN OR GERMAN MEASLES (RUBEOLA NOTHA).

Usually a mild affection, resembling common measles—Symptoms—Sorethroat invariably present—Slight fever as a rule—Period of incubation.

Diagnosis—Premonitory fever seldom exceeds twenty-four hours.

Treatment—Rest in bed—Diaphoretics—Sedatives.

Rötheln (*scarlatina morbillosa, hybrid measles*) is reckoned as a mild affection, and frequently fails to come under the notice of the great bulk of the profession. It is, however, of importance, and possesses special peculiarities. Formerly some observers regarded the disease as a modification of measles and scarlatina, hence the term *hybrid*, but this view no longer prevails, and it is fortunate that it is so, for it conveys the erroneous impression that the disease is a combination of measles and scarlatina. Copland speaks of rötheln under the head of rose-rash, and terms it red-rash, or false measles.* Obscure cases of erythema or urticaria are sometimes mistaken for measles or scarlatina, and it is certain that in practice we encounter cases of febrile excitement in young children attended with a rash of uncertain character, which it is impossible to classify under any recognised exanthem.

Symptoms.—In mild cases the disease commences with very slight constitutional disturbance. In severe cases it is ushered in with shivering or even rigors, febrile disturbance, frequent pulse, headache, pains in the limbs, and in some cases nausea, and even vomiting. Sorethroat is one of the most invariable symptoms, being present in the mildest cases; the tonsils are red and swollen, and remain so after the fading of the rash, but they are less severely affected than in scarlatina, and rarely become ulcerated. There may be no fever at all, or only a transient attack before and during the eruption (Wunderlich). In some cases, however, in children, the temperature rises above 103°, and the pulse to 160 (Liveing). In addition to these symptoms, the respiratory organs are sometimes slightly affected, and there is catarrh, short cough, redness of the conjunctiva, sneezing, and coryza.

The period of *incubation*, before the eruption appears, is estimated at from ten to fourteen days. Dr Park had 100 cases under his care in an orphan asylum, and he could not make out a definite period of incubation. Two thirds of the children exposed were attacked, and most of them had suffered from measles during the previous winter and spring. The bronchial irritation, the conjunctival effusion, and the general appearance resembled true measles.[*] After the fever has lasted three or four days the eruption makes its appearance, but it may be the first symptom of the disease. The eruption continues in mild cases about five days, and from eight to ten days in severe ones. This is followed by slight desquamation of branny scales. It appears to me that not much reliance can be placed upon the duration of the eruption, or on the extent of desquamation, as in a case of ordinary measles under my care in 1877, the skin was desquamating at the end of a month, the eruption, though faded, was distinct at the fourteenth day, and after washing, it was quite bright on the extremities, neck, and shoulders. In severe cases of rötheln, the child becomes restless when the eruption is at its height, and convulsions and death by coma are recorded.[†]

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* 'Medical Dictionary,' p. 652.

The eruption usually first appears on the trunk of the body, but sometimes on the face, neck, and arms; it is characterised by small red elevated patches, or distinct and minute red papules—it presents the condition known as "measly." These papules coalesce and run together, forming irregular patches, as we see in measles, but there is not the same tendency to assume a horseshoe or crescentic shape. When the patches unite, the body becomes universally red, and the eruption resembles scarlet fever, being brighter than that seen in measles. These patches in ordinary cases, are about the size of a sixpence, but in severe cases, they are as large as a crown piece. Dr Murchison says "the eruption is copious in a direct ratio to the severity of the general symptoms; it lasts longer, as a rule, than the rash of either measles or scarlatina—from four to five days."[‡] Dr Liveing remarks, that the protracted duration of the eruption is one of the characteristics of the malady, but it is of no value as a means of early diagnosis.[§] Murchison and Liveing both speak of the occasional presence of catarrh, whilst Vogel notifies its uniform absence. Of 27 cases recorded by Dr Shuttleworth, there was an almost universal absence of catarrhal symptoms.[||] It is probable that different epidemics vary a little in their symptoms, as is the case with common measles. With the appearance of the eruption, the throat affection is apt to increase, and the swelling in rare instances becomes so great that the patient is unable to swallow. In many cases the cervical glands become inflamed and enlarged.

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[*] 'Chicago Medical Journal and Examiner,' Aug., 1881.

[†] 'Aitken's Science and Practice of Medicine,' 1872, vol. i, p. 492.

[‡] "Cases of Rötheln or German Measles," 'Lancet,' vol. ii, 1870, p. 595.

[§] 'Diagnosis of Skin Diseases,' 1878, p. 50.

[||] "The Real Position of Rötheln or German Measles," 'International Medical Congress,' 1881, p. 374.

Diagnosis.—The disease presents some symptoms allied to, but many unlike the common form of measles. The eruption is said to partake of the characters both of measles and scarlatina, yet it is now regarded as specific and distinct from both, the points of difference being always well marked. The swelling of the throat and tonsils, and the white coated tongue, followed by redness and enlargement of the papillæ, resemble scarlatina; while the catarrh and congestion of the air passages liken it to measles. But it is less severe than either of these fevers. The remarkable feature of the affection is, that the premonitory fever instead of lasting three or four days, as in common measles, seldom continues more than twenty-four hours, when the rash makes its appearance, and hence if this be true, we have a means of diagnosis which is distinct and valuable.

Another very important feature of rötheln is that it never produces measles or scarlatina in others, so that, from this point of view, it is entitled to be regarded as a distinct and independent disease. It has a tendency to propagate itself, and epidemics of it have been recorded, but it is doubtful whether the disease is so contagious as the other exanthemata. It affords, moreover, no protection against the two diseases to which it bears a close resemblance, for some children who have suffered from it previously, and others subsequently, had both scarlatina and measles.

The disease, though highly contagious, appears to be more epidemic than measles or scarlatina, and is a milder affection than either. One attack is protective against a recurrence of the disease, but not against a subsequent attack of common measles, or scarlet fever.

The idea has been started that rötheln is common measles modified by a previous attack, but the fact that rötheln frequently precedes measles is conclusive against this view.

Albuminuria and dropsy are rare complications; these diseases may result from the temporary renal congestion of ordinary measles, but their absence distinguishes them from the sequelæ of scarlatina.

I would again repeat that the type of the disease varies with the particular epidemic; a fact which is too apt to be lost sight of, and which explains the slight differences in the descriptions of authors.

The *treatment* consists in confinement to bed, a febrifuge mixture to encourage diaphoresis (Forms. 7, 12), and, if catarrhal symptoms arise, demulcent and sedative remedies (Forms. 65, 66, 74) as the case may appear to demand them.

CHAPTER IX

SCARLET FEVER OR SCARLATINA*

VARIETIES OF THE FEVER AND THEIR CLASSIFICATION—1. *Scarlatina simplex—The premonitory or incubation stage—2. The stage of eruption—3. The stage of decline and desquamation.*—2. SCARLATINA ANGINOSA—*Character of the throat affection and its relation to the eruptive stage—Increased severity of the constitutional symptoms—State of the tongue, pulse, and temperature—Alteration in the cardiac sounds.*—3. SCARLATINA MALIGNA—*State of throat and tonsils—Constitutional symptoms of an adynamic type.*—4. SCARLATINA SINE ERUPTIONE—*Absence of the specific eruption and mildness of the symptoms—Tendency to anasarca and dropsy—Morbid Anatomy—Relation to enteric fever.*—CAUSES AND CONSEQUENCES—*Predisposing and exciting causes—Pathology and morbid appearances—Mortality—Sequelæ of scarlet fever—Liability to anasarca and acute desquamative nephritis—Congestive or uræmic headache.*—TREATMENT AND GENERAL MANAGEMENT OF THE DIFFERENT VARIETIES—*Aconite and its mode of action—Sponging the body in high temperature—Delirium and coma—Scarlatinal dropsy—Effusion into the serous cavities—Treatment of the throat affection—Preventive measures.*

SCARLET fever, or scarlatina, may be defined as a contagious and infectious fever, attended with a punctiform scarlet rash on the body, and with inflammation of the tonsils and fauces. Three varieties are described :

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* "The term 'Scarlatina' is said to have been the vernacular name for the disease on the shores of the Levant, and was first adopted in a medical work by Prosper Martianus, another Italian physician, who, about the middle of the sixteenth century, also described the disease as distinct from morbilli. Epidemics of scarlet fever were first described in this country by Sydenham in 1676, and about the same time in Scotland by Sir Robert Sibbald, physician to Charles II, and in the middle of last century by Fothergill and Huxham."—"Clinical Lectures on Medicine," by Dr Murchison, "Case of Rötheln or German Measles."—*The Lancet*, Oct. 29, 1870, p. 595

1. *Scarlatina simplex.*
2. *Scarlatina anginosa.*
3. *Scarlatina maligna.*

Scarlatina has three well-defined stages :—1. The premonitory or incubation stage. 2. The stage of eruption. 3. The stage of decline and desquamation.

1. *The incubation stage* lasts from the day of infection till the commencement of the febrile symptoms, and is usually short. It may extend from three to five, or even eight days. In some instances the period may continue only a few hours.* There is no exact rule to go by as to the duration of this stage; one child will resist infection for a longer period than another, or the infection will be slower in disturbing the health. Some children are more susceptible than others; and the character of the epidemic may differ in severity. A child may be feeling out of sorts for days, languid, depressed, and "off his appetite;" but the illness excites no apprehension if scarlet fever be not prevalent at the time. When chilliness, thirst, quick pulse, and increased temperature succeed, the parents become anxious. Diagnosis is even now impossible, but if there is nausea or vomiting, and the tonsils and fauces are inflamed during the prevalence of an epidemic, we can scarcely mistake the character of the fever. As the case progresses the breath becomes intensely hot, the skin pungent and burning; and, towards the evening, or during the night, the cerebral functions may be so disturbed as to lead to convulsions or delirium. At this stage the characteristic eruption will appear, which is seldom delayed beyond twenty-four hours.

2. *The eruptive stage* is characterised by small red points upon the neck and chest, which extend to the trunk and limbs, especially the inside of the thighs, and the flexures of the joints. It is less vivid on the face, where it often presents irregular patches. It generally makes its appearance on the second day, but sometimes it comes out in twelve hours, and in twenty-four hours the eruption assumes a general erythematous appearance, and the patient becomes as red as a "boiled lobster." The rash is fully developed by the third or fourth day. It is often variable in severity and mixed in character, thus it is not invariably universal; in some cases it may be slightly papular and mixed with sudamina, and the skin is so rough to the hand that it presents the condition known as "*Cutis anserina.*"

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* Of 75 cases collected by Dr Murchison, the latent period was less than twenty-four hours in some, and in none did it exceed six days.—'Clin. Trans.,' 1878, p. 257.

When the spots are small, scattered, and dusky, there is ground for alarm, but when there is a bright, well-developed, and general eruption, it relieves the internal organs from excessive oppression by the fever poison. The eruption is brightest in healthy and strong children, whereas in the feeble it is limited, and the spots approach a claret hue. The rash generally begins to fade from the fourth to the sixth day, and by the ninth or tenth day has in most cases disappeared.

The throat of scarlatina is never so painful as it is in severe tonsillitis, where the swelled tonsils almost occlude the pharynx from tumefaction and threatening suppuration.* The tongue is very characteristic in most cases, but, like the eruption, does not invariably assume the same appearance. When the eruption is brightest and the fever runs high, the dorsum and centre of the tongue are covered with a white creamy fur, and the elongated papillæ project through the deposit, giving the tongue the appearance of a white strawberry. The temperature frequently runs up to 105° or 106°, and some of the worst and even fatal cases in children have not exceeded it. It has, however, been known to exceed 112° in fatal cases. When the eruption is fully developed the temperature is at its highest point. It continues to rise till the exanthem has reached its maximum, and covers the whole body. This rise may continue from half a day to four days. Wunderlich says the height reached is almost always above 104°, but rarely does it exceed 105·8° in cases that recover.† The fever and the rash appear to hold a close relation to one another, and they subside simultaneously, leaving the patient weak and languid. In the decline of the disease, the urine frequently contains albumen, and the child is pale and thin. About the third week after apparent and complete recovery from mild scarlet fever, anasarca and albuminuria may set in.

3. *The stage of desquamation.*—The skin begins to peel where the eruption first made its appearance, and if it has been copious, the old epidermis may exfoliate in large scales, or come away from the fingers like a glove; the process is a very slow one, and if precautionary steps are not taken may extend over many weeks. The mucous membrane also participates in this process, by the escape of phlegm from the fauces, and epithelium from the renal passages. The motions at this period are also putrid and offensive, and indi-

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* The diagnosis of the throat affection is considered in Chap. XXIX, "On Diphtheria."

† 'Medical Thermometry,' 1871, p. 348.

cate the profound effect of the fever poison on the two chief excretory channels.

1. *Scarlatina Simplex* begins with the usual symptoms of fever, thirst, loss of appetite, quick pulse, hot skin, headache, pain in the back and limbs, restlessness and disturbed sleep. Vomiting is a common and early symptom. I have constantly observed it before the rash, and so anticipated the disease. Diarrhœa sometimes begins at the commencement.

The eruption is first seen on the chest, neck, and abdomen, and especially over the thorax and bends of the joints. On exposing the back and loins it may be often seen most distinctly. The eruption disappears on pressure, and returns at once when it is removed. About the fifth day the rash declines, and by the eighth it fades and disappears. The cuticle begins to peel and separate about the fifth day from the parts first affected, and this process may continue for many weeks. The hands and trunk may be seen to throw off small or large scales; and, whilst it lasts, there is great irritation and itching of the skin. At the commencement of the disease, before there is any rash on the body, or the throat is sore, there is pain and difficulty in swallowing. On looking into the throat the tonsils are noticed to be swelled and inflamed, and lymph may be seen adherent to them; there is diffused redness of the soft palate; the uvula is also red and elongated, and the pharynx inflamed. The tongue is covered with a thick white fur, and the papillæ may be seen through it. Sometimes in the course of two days the fur disappears, and leaves the tongue of a strawberry hue, or it is red and strawberry-looking from the first. Occasionally the tongue is only slightly furred, and there is nothing characteristic about it. The appearance of the rash is not attended by any subsidence of the fever, the skin being hot and burning, and the temperature much elevated (104° or 105°), with wandering and delirium at night. The pulse is frequent, small, and weak, and ranges from 120 to 130 a minute. The urine is scanty and high-coloured, containing urates at an early stage, and commonly albumen later on. During the fever the amount of urea and uric acid excreted by the urine is increased, while that of the chlorides is decreased.* The rash does not always appear on the second day, it may be delayed in some cases till the third or fourth day, or commence on the first day of the fever. In the mildest cases there is little else noticeable than a general erythema of the skin; there is no pain in swallowing, nor inflammation of the tonsils or pharynx, or, at any rate, the reddening of the throat is so slight that it may well escape attention. The eruption comes out and continues the usual period, followed by desquamation.

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* 'Clinical Essays,' "History of Scarlet Fever."—Dr Richardson, 'Asclepiad, vol. i, p. 114.

2. *Scarlatina Anginosa.*—Here the throat is more severely affected, and the sub-maxillary glands are frequently enlarged and tender so that the patient has pain on opening his mouth or in swallowing; the tonsils are covered with a fibrinous or sloughing exudation; one tonsil may be more affected than the other, or neither may be implicated in this way. On the first day of the fever, before the rash appears, I have seen the right tonsil excavated by a deep, ragged, ashy-looking ulcer, and the tongue loaded with a creamy fur at the back. I have also noticed a similar ulcer on the fifth day of eruption, and general inflammation of the pharynx and uvula, whilst the fur is cleaning off the tongue. Mucus collects about the fauces and throat, causing troublesome hawking and spitting, as well as heavy breathing, and the inflammation extends to the nose or runs along the Eustachian tube to the ear. In one case the whole external ear assumed an erysipelatous redness, and there was much deafness. The patient recovered without any otorrhœa, and with unimpaired hearing. As in the former variety, the eruption comes out on the second day of the fever, when the throat usually becomes easier; the eruption may appear first on the arms and chest, for the reason, probably, that protected parts are least likely to be chilled. The rest of the throat may now be swelled, and the left tonsil may present two or three small ashy sloughs, like the right. The temperature may run up to 104° or 105° when the rash is well out, and there is probably no disease in which it is so high. Unlike smallpox, the temperature rises with the appearance of the rash, and undergoes no sudden fall as in measles when the eruption is at its height. The pulse may reach 120 or 140; occasionally it is much more frequent, and if weak also is a sign of danger. The respiration is always accelerated; it is sometimes shallow, and attended with dilatation of the nostrils, laryngitis, bronchitis, or pneumonia. The urine at this stage is turbid, often high coloured, and contains a large quantity of ateritious sediment. In some cases the swelling of the throat ncreases, and the voice becomes husky and weak, though the pulse ay have fallen in frequency. On the third day of the fever the elids may be swelled, and the conjunctivæ so inflamed that the

patient cannot open the eyes; it leads sometimes to ophthalmia tarsi, and repeated small abscesses in the lids. By the fifth day the extension of the sloughing may have ceased, though fresh portions of greyish slough may fix on the uvula, and on any sound part of the tonsils. The skin now becomes cooler, and the temperature falls, the puffiness of the face subsides, and the tongue cleans. The cutaneous irritation at this stage is extreme, and in some cases prevents the patient from obtaining any rest or sleep. Severe febrile symptoms may arise in less than twenty-four hours after infection.

In some cases this variety of scarlet fever is attended with more severe constitutional symptoms than those I have enumerated; sleep is disturbed, and exhaustion sets in early; the pulse is frequent and feeble, the secretion of urine nearly suppressed,[*] and effusion takes place into one or more of the chief cavities of the body.

Extreme restlessness, delirium, convulsions, tremor of the muscles, subsultus and picking at the bedclothes sometimes occur in serious cases, and usually have a fatal termination.

Scarlatina Maligna (Cynanche Maligna of Cullen).—This is the most alarming variety of all; the disease concentrates its virulence on the throat and tonsils, where dark offensive exudations form, with deep ashy-looking ulcers and sloughs. The pharynx, uvula, and part of the hard palate are sometimes seen covered with a gangrenous deposit, and a bright red line of demarcation is visible. Similar ulceration may also be seen on the inside of the cheeks in severe cases; the nostrils also become inflamed, and furnish a thin irritating discharge, which inflames and excoriates the lip. The salivary glands are also inflamed and swollen. The fever at an early stage of the disease assumes an adynamic type, and the constitutional depression is severe. Vomiting is distressing and rigors are frequent. There is wandering and drowsiness, or great irritability and restlessness; the pulse is feeble and rapid, or irregular; the tongue dry, brown, and chapped, and sordes may be seen on the lips, teeth, and gums. The temperature runs high, in a fatal case under my care it reached 108°. Sometimes the patient dies before the abortive eruption comes out, as early as the first day. There is no uniformity in the time of its appearance or in its characters. It is often dark and in irregular patches, or it may be pale and bright at first, and then change soon to a claret hue, some spots being larger than others, and there are also observed in some cases petechiæ, which prove that the blood is much changed. The disease in many cases proves fatal on the third or fourth day. The patient may be sensible to the last, or die comatose or in convulsions. How far this variety differs from the others in its real nature is still an undetermined question. Is not the disease the same in all cases—a distinct fever, brought about by a specific poison, but from constitutional predisposition, locality, physical conditions, or extreme susceptibility of the organism, assuming a mild or a severe form? Epidemics vary in their severity, and produce varieties of type, but a number of collateral circumstances must be ranged side by side, before we can admit any essential difference in the nature of the disease.

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[*] I saw in consultation a little boy in 1878, who on the fifth day of the eruption passed only two teaspoonfuls of urine in twenty-four hours, containing a considerable quantity of bile pigment, and a trace of albumen, so that there was ample proof of very defective elimination. The patient was weak, restless, and wandered at night; the throat was severely affected, and there was a difficulty in getting him to take nourishment. A poultice was applied to the loins, and next day a free secretion of urine took place in which neither bile nor albumen could be detected. Mr Naughtin, of Baker Street, informs me that he attended a child, aged six years, in 1875, who did not pass urine for seven days, and she was delirious the whole time. The suppression came on ten days after the eruption had disappeared, and it seemed traceable to eating heartily of indigestible food. There was no vomiting. The first urine passed after this long interval was about a teaspoonful, and approached the colour of ink. As the quantity increased the colour became normal, and the patient experienced no subsequent inconvenience.

There is a form of latent scarlet fever (*scarlatina sine eruptione*) which is of so mild a character that the disease is not suspected till the general health shows signs of failure. I have seen children on various occasions suffering from anæmia and general debility, with or without albuminuria, who have had some desquamation of the skin without the specific eruption. In one case, a little girl, who was said to have escaped the disease when her brother was laid up with it, came under my treatment for symptoms of general debility. Her urine was scanty and non-albuminous, and there was not any sign of anasarca, but I could not avoid associating her state with the probability of infection. She may have had some sore throat and feverish disturbance, but they were not noticed by the mother, though her skin was rather harsh, and the epidermis inclined to peel at the tips of the fingers.

Anasarca occasionally has its origin in the poison of scarlet fever when there has been neither eruption nor albuminuria. It is attended almost invariably with albuminuria, and is due to nephritis. The quantity of albumen is often large, and blood is usually mixed with it. I have met with three cases of scarlatinal dropsy, without albumen in the urine.[*]

Dr Dyce Duckworth has recorded a case of "Scarlatinal Dropsy with little or no Albuminuria."[†] Gee,[‡] F. Roberts,[§] Bristowe,[||] Todd,[¶] Hillier,[**] and Dickinson[††] also allude to such instances. Niemeyer mentions "cases of very extensive scarlatinous dropsy without albuminuria," free from danger and rapid in recovery.[‡‡] Bartels refers to an epidemic of scarlet fever in 1853-54, "in which dropsy set in afterwards, although the urine passed by the patients contained no albumen." In all these cases very little urine was excreted, but soon afterwards an abundant excretion of bloody urine set in whilst the dropsy increased. From these observations he concluded that the kidneys of the dropsical patients were in a state of inflammation, when the urine was scanty, although free from albumen. He quotes a case by Henoch,[§§] of a boy, 12 years of age, suffering from œdema of the face and scrotum, three weeks after an attack of scarlatina, in which the urine was scanty, very acid; the sediment consisted of amorphous urates, and was free from albumen. Two days after admission into hospital "he had a violent eclamptic attack, with complete loss of consciousness." The urine now contained "a large amount of albumen and numerous hyaline casts, beset with granules." Three days more elapsed and he died. At the autopsy "extremely well-marked parenchymatous nephritis was found on both sides." Both writers agree that the dropsy is always due to nephritis, whether albumen is present in the urine or not. Bartels thinks the intermittency of the albuminuria may be due to suspension of those portions of the kidney which are involved in the morbid process, whilst those portions not involved may secrete urine free from albumen.[||||]

Morbid Anatomy.—The anatomical changes found after death in cases of scarlet fever present nothing characteristic. The throat and tonsils show traces of inflammation, and the gastro-intestinal glands may be ulcerated. The solitary glands and Peyer's patches are frequently swollen and injected. The liver and kidneys may be softer than natural, whilst the spleen is firm, and now and then greatly enlarged. The right cavities of the heart may be distended with blood and fibrinous clots. Pulmonary catarrh, pneumonia, and pericarditis are to be observed in some cases. Dr John Harley in twenty-eight fatal cases found the morbid changes to resemble those of the first stage of enteric fever.*

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[*] 'Brit. Med. Journ.,' vol. i, 1884.

[†] 'St. Bart. Hosp. Rep.,' vol. xix, p. 323.

[‡] 'Reynolds' System of Medicine,' 1866, vol. i, p. 347.

[§] 'Theory and Practice of Medicine,' 1877, p. 140.

[||] 'Theory and Practice of Medicine,' 1876, p. 162.

[¶] "On Dropsy after Scarlet Fever" (Urinary Diseases), 'Clin. Lectures,' 1857, p. 178.

[**] 'Diseases of Children,' 1868, p. 304.

[††] 'Path. Trans.,' vol. xxi, p. 263.

[‡‡] 'Text-book of Practical Medicine,' 1875, vol. ii, p. 543.

[§§] 'Berliner Klinische Wochenschrift,' 1873, No. 50.

[||||] 'Ziemssen's Cyclopædia of Medicine,' "Diseases of Kidney," vol. xv, p. 278.

If a child goes on well for the first week or ten days of scarlet fever he commonly gets over the attack, but there are crises and relapses which expose the child to danger till convalescence is permanently established. The violence of this short fever is less alarming than in almost any other complaint. Delirium is apt to subside of itself, and to disappear as soon as the crisis is fully reached. Dr Gairdner quotes the opinion of Heberden, who also entertained the view that there "was no disease in which the patient was more apt to be delirious, and with less danger, than in scarlatina."† Such remedies as antimony and opium are out of the question, and shaving the head to meet the delirium would only be necessary in exceptional cases. Where delirium arises the little patients should be carefully watched and tended, but excessive interference is bad practice, and does an infinity of harm.

Causes.—These are due to the influence of a specific and highly contagious poison. The poison retains its power for a considerable length of time, and the clothes worn by patients suffering from it, as well as carpets, curtains, &c., absorb it. There can be no doubt whatever that medical men sometimes convey it from patient to patient, and so carry it to their own families. Infection is great during the time of desquamation, but it is worthy of notice, that some persons are more susceptible to infection than others, and that a severe disease, though apt to produce its like, may also result from a mild one.

There is no proof that the disease is communicable in the pre-eruptive stage, which is not the case with measles, where infection can be conveyed in the catarrhal stage.

Children at the breast are rarely affected by scarlet fever, but such cases are recorded; the disease is more prone to occur about the second and third year, though there is very little difference up to five years of age, and after this period the deaths undergo a remarkable diminution, but nothing like that observed in measles. Then with regard to the proportions of deaths in the two sexes; more males are said to die under the age of ten, and after ten more females; but as the population in any given district may vary considerably between the two sexes the distinction is not easily recognisable.

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* 'Med.-Chir. Trans.,' vol. lv, p. 103. "The Pathology of Scarlatina."

† 'Clinical Medicine,' 1862, p. 193.

As to the influence of meteorological conditions most writers agree that the disease is most prevalent in the autumn, and least in the spring; next follow the summer months, and lastly the winter.

The average annual mortality in England alone from this terrible scourge is estimated at from 20,000 to 22,000. It is greater in towns and cities than in rural districts, and stands highest on the list of communicable diseases. Then follow whooping-cough, measles, and smallpox in the order I have placed them. Although scarlet fever rarely happens a second time, numerous well authenticated cases are placed on record. When it does happen that a child is seized with a recurrence of the disorder, it is exceptional, and so mild in its nature and progress that it seldom proves fatal.

Concerning the recurrence of scarlet fever many examples are to be found. A case occurred in the London Fever Hospital under the care of Dr Broadbent, where the patient had a second attack after being convalescent from a first attack, and whilst the skin was still desquamating.*

A similar case of recurrence two months after the first attack, came under the care of Mr Elkington, at the "Birmingham and Midland Hospital for Sick Children."† The child, 3½ years of age, was admitted on November 22nd, 1875, suffering from a large abscess in the left thigh. There was a history of scarlatinal eruption and sore throat six weeks previously, and the patient was still desquamating. The temperature on admission was 104°. On the 23rd, the abscess was opened antiseptically, and two ounces of thick creamy pus were evacuated. A drainage tube was inserted and for the next eleven days all went well, the temperature keeping normal and the abscess closing quickly. On December 5th, the patient had headache, sore throat, and vomited several times; temperature 105°. A rash, resembling scarlatina, was visible on the chest, arms and neck, and there was great congestion of the throat and tonsils. On the 6th, the rash was fully developed over the whole body, accompanied by intense thirst and restlessness. Morning temperature 103°, evening nearly 106°, with delirium. From this time the progress was favorable, the rash fading, and the skin desquamating like an ordinary case of scarlatina. On the 13th the temperature was normal.

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* 'British Medical Journal,' April 1st, 1876, p. 411.

† Ibid.

The only rational explanation that can be offered for the recurrence of scarlet fever and other infectious diseases, is that one attack does not exhaust the patient's susceptibility to these diseases.

Sequelæ.—These are numerous and troublesome. The most important (though rare) are—1. Anasarca and uræmic poisoning. In mild cases more frequently than in severe, dropsy comes on about the second or third week of the disease, and gradually passes away without any serious consequences, but now and then severe headache, high temperature, and fatal convulsions ensue. I have recorded such a case*. 2. Pericarditis and Pleurisy. 3. Acute Rheumatism leading to disease of the cardiac valves and sometimes to embolism. 4. Chorea and Epilepsy. 5. Bronchitis and Pneumonia. 6. Sloughing of the throat and tonsils. 7. Enlarged cervical glands, terminating in abscess. 8. Ophthalmia, sometimes purulent and leading to sloughing of the cornea. 9. Ozæna. 10. Hypertrophy of the tonsils. 11. Persistent anæmia. 12. Otorrhœa and deafness.

In 1862, I attended a girl seven years of age, who was seized with the most severe type of the disease, in which the glands of the neck were greatly implicated, and the delirium was so fierce and continuous that her life was despaired of. She made a tedious recovery through having an abscess on the right side of the neck which pointed over the mastoid process, and led to exfoliation of the temporal bone. Otorrhœa continued more or less, and pieces of bone came away. Twelve years elapsed before the local trouble was cured and the wound healed, but now the hearing is perfect and the health re-established after years of extreme medical care and nursing, which only the wealthy and affluent could procure.

Of all the sequelæ, anasarca is the most serious. If, during the period of desquamation, the patient is exposed to cold from incautiously venturing out too soon, and a chill is received, the escape of the fever poison, instead of taking place through the skin, is directed to the kidneys, and this sets up irritation, and acute desquamative nephritis. It does not induce this in all, as I have on several occasions seen puffiness of the lower eyelids at the end of three weeks, and swelling of the glands in the neck, whilst desquamation was going on without albuminuria. With the kidney affection there is headache, pain in the loins, sickness and diarrhœa, and a large quantity of albumen in the urine, which may be clear when first passed, or turbid and loaded with urates. It may vary from day to day, and sometimes contain a considerable quantity of cayenne pepper-looking crystals of uric acid; but the albumen may remain undiminished, particularly if animal food is indulged in, or there is any other error in diet. Effusion into the pleural, pericardial, and abdominal cavities is common, and the temperature is apt to run high.[*] All these symptoms may improve without any diminution in the quantity of albumen.[†]

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* Ibid., 1884.

My experience leads me to think that tuberculosis can be more frequently traced to scarlet fever than is generally supposed.

A serious consequence of scarlatina is the headache of uræmia, which I have elsewhere fully considered.[‡] At the end of three or four years, and long after every trace of dropsy has disappeared, the child so declines in health and spirits that the attention of parents is at last awakened to his altered condition. He is unable to pursue his studies at home or to continue at school, and he has no inclination to join in the pleasures of his playmates. A severe and continuous frontal headache ensues, and the child loses his vivacity and interest in everything. The veins are full about the head and lips, in some cases, and there is a set colour on the cheeks. The urine is scanty and contains albumen, with renal casts and epithelium; it varies greatly in some cases, the deposit thrown down some days being very considerable, and at other times barely perceptible. Indulgence in animal food is prone to cause renal congestion in these cases, with an aggravation of the head symptoms, and there is associated with it sometimes, dilatation and hypertrophy of the left ventricle, increased tension in the pulse, perceptible to the finger, but more accurately estimated by a sphygmographic tracing. For the treatment of this complication the reader is referred to the chapter on albuminuria.

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[*] *Vide* Chap. XXIII, "On Acute Desquamative Nephritis," and "Œdema of Lungs," Chap. XXXVII.

[†] "The percentage of kidney complications in scarlet fever varies from five to seventeen. Frerichs has described a rare form of dropsy without any disease of the kidneys occurring after scarlet fever, which he believes to be due to paralysis of the cutaneous nerves by exposure to cold during desquamation, and I have lately seen one such case, where repeated examination of the urine revealed no change, whilst there was very acute dropsy of the skin, without any effusion into cavities, which lasted twelve days."—Steiner on 'Diseases of Children,' by Lawson Tait, p. 341.

[‡] 'Headaches, their Nature, Causes, and Treatment,' by W. H. Day, M.D. 3rd edit "Toxæmic Headache," Chap. IX.

Treatment.—This consists in mild cases of confinement to bed, a gentle laxative, or a soap-and-water enema if there be constipation, and cooling drinks. Cold water is an excellent drink, and should be given unsparingly. Milk and water, chicken broth, and weak beef tea are the proper articles of diet. If there be sickness and general disturbance at the onset of the complaint, an emetic of ipecacuanha should be given, followed by a dose of castor oil. If there be diarrhœa it must be restrained by mild astringents. (Form. 30, 31.)

The sick room should be kept at a temperature of 55° to 60°, and be rid of all carpets, curtains, &c. Pure air should be freely admitted. In hot weather, during the rising of the fever, free ventilation of the sick apartment is not apt to induce cold, but when desquamation has set in there is great susceptibility. In the shape of medicine, the liquor ammoniæ acetatis, or small doses of carbonate of ammonia, may be given three or four times a day. The mild form of the disease, however, will generally run a satisfactory course with attention to the bowels and care in diet.

I am here constrained to point out the value of the action of aconite in reducing fever and inflammation, from the influence it exerts in bringing down the temperature and lessening blood pressure. From what we know of its power in subduing fever in some cases of surgical pyrexia it is unquestionably a remedy of great value, and if we consider the tendency which the blood has to coagulate in its passage through the central organ of the circulation, it might be advantageously resorted to in the early stages of this disease. It brings down the pulse, and promotes a free action of the skin, and encourages the loss of heat by evaporation. In some cases it reduces fever and inflammation, as in tonsillitis, without promoting perspiration. I fully agree with Dr Fothergill that the specific action of aconite is exerted on the vascular system, by paralysing the vaso-motor nerves and lessening the contractility of the vessels. If then it has the power of dilating the vessels, and by drawing the blood towards them diminishing the tension in an inflamed part, it ought to be employed where this condition is present. All who have given the remedy a fair trial in catarrh, sore throat, and inflammation of the tonsils, will be willing to admit that it converts with marvellous rapidity a dry and burning skin into one that is moist and sweating, and in this way it relieves the restlessness and constitutional disturbance. Aconite is of most service and can be more advantageously employed when the pulse is hard, and the action of the heart strong and violent. My own experience of the action of aconite is, that it lessens the frequency and increases the fulness of the pulse; it reduces the hardness and incompressibility. Half a minim in a teaspoonful of water for a child should be given every hour, but should the pulse become weak and irregular, or there be any sign of weakness or prostration, it ought to be discontinued. The indication for giving aconite is elevation of temperature, for where it is present there is fever or inflammation; when the temperature is normal or nearly so, it should not be employed, but when it shows indications of rising, and the pulse, though not more frequent, becomes more resisting, it may be prescribed. During scarlet fever, or after it, when kidney complication has arisen, aconite may be given, for if it does not shorten the fever it soothes the nervous system, and by promoting free perspiration controls the inflammation that attends it, and moderates the throat affection. When the throat is dusky and much swollen, and the symptoms assume a typhoid character, aconite would be too depressing, and the local disorder is best treated by the application of nitrate of silver or the diluted tincture of the perchloride of iron. Internally, the iron and chlorate of potash mixture recommended in diphtheria will be found invaluable. (Form. 54.)

In *Scarlatina Anginosa* an emetic should be given if there is nausea, or the digestive organs are loaded, and the tongue is heavily furred. A grain of calomel, followed in two or three hours by an active aperient, may be ventured upon if the pulse is firm and the fever runs high. Throughout the complaint, and especially if there be much excitement, the bowels must be kept open.

Salicylate of soda is an excellent drug to reduce the temperature, which generally falls after two or three doses. It allays excitement and quiets the patient. In cases where exhaustion has to be feared, I have omitted it after the fever is reduced, and resorted to it again when it has returned. Acetate of ammonia, nitrate of potash, dilute hydrochloric acid and chlorate of potash are serviceable. Effervescing medicines with carbonate of ammonia and lemon-juice are refreshing and agreeable to take. Milk and potash or soda water frequently, ice to suck, and beef tea or chicken broth are demanded. Warm linseed poultices, or even two or three leeches to the throat will be advisable, if there be swelling about the jaws, or much pain in swallowing.

Stimulants are not required in mild cases, but where there is a tendency to collapse, or typhoid symptoms threaten, they ought to be given.

Sponging the body with vinegar and tepid water (one in four), or iced water if the temperature runs high, should be practised three or four times a day. I prefer this milder practice to cold affusions, or cold wet packing, which so far as my experience goes, are only to be adopted in exceptional cases. The treatment by cold water has proved curative in this variety of scarlet fever when cerebral symptoms are present, and coma threatens; no other remedy except cold having the power to reduce the hyperpyrexia, as in those cases of rheumatism where a dangerous rise of temperature takes place.* This plan should be adopted when all other remedies fail, and the skin is extremely hot, the pulse full, and there is drowsiness, convulsions, or delirium. It is better to immerse the patient in tepid water first, and gradually cool it by the addition of ice. The effects of the bath on the temperature should be carefully watched, the patient not being kept in it for more than ten minutes at one time. If there is delirium and a tendency to coma, the scalp may be shaved, and cold lotions applied to the head. In this form of the disease, depression soon sets in, and port wine, beef tea, champagne and soda water will be required.

For the throat affection, if the patient is old enough to manage it, a gargle of chlorate of potash and dilute hydrochloric acid will correct the unhealthy exudation that hangs about the throat, but in the case of very young children this cannot be used, and then mopping out the fauces with a solution of nitrate of silver (gr. x to the ℥j) twice a day will be effectual in most mild cases, or a weak solution of chlorinated soda may be substituted.

The inhalation of the steam of hot water as long as the throat is sore, is a safe and excellent practice, and according to Dr Gairdner, supersedes almost all other local applications.† The inhalers used for this purpose, however useful and easy of application for adults, are somewhat alarming, and difficult for very young children.

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* See Chap. XLVIII, "On Acute Rheumatism."

† 'Clinical Medicine,' "Scarlet and Enteric Fever," p. 196.

It is most important to remove the exudation on the throat when it is freely secreted, before having recourse to any application. A piece of cotton-wool (the size of the little finger and about three inches in length) should be twisted round the end of a bent throat brush, and carried over the base of the tongue into the fauces, then by a rotatory motion it is brought back in such a manner that it comes well in contact with the posterior part of the pharynx. This proceeding, with the hawking and retching which it creates, removes a large quantity of poisonous secretion to the immediate relief of the sufferer. As soon as this is accomplished, the spray should be used for a minute or so, and the patient fed. In a severe case (under my care in 1883) in a boy seven years of age, the temperature fell invariably after this proceeding; he could swallow better, and slept tranquilly for three or four hours, when the throat was again cleaned. This should be done at least three times in the twenty-four hours, or as often as the state of the throat may appear to warrant.

It sometimes happens that when the fever accompanying the eruptive stage is declining, the temperature has fallen to normal, and the throat is better, the cervical glands on one or other side begin to enlarge, and though tenderness is not complained of, and there is no evidence of suppuration in them, the patient again becomes feverish, and the temperature rises as high as 103°, or more at night. The inflammatory state of the glands alone would seem to be sufficient to account for this febrile rise, even when the kidneys are healthy, and nothing else can be discovered wrong. If the temperature rises night after night at this stage, suppuration in the cervical glands is often the lurking cause, or it may be the prelude to nephritis, followed by convulsions and death, as I have known.

When the exudation is of an ashy colour and inclined to extend, the solution of perchloride of iron, applied on a sponge with forceps, will exert an excellent effect. It should be used night and morning at least, and after two or three applications, the throat will assume a more healthy appearance and the fœtor of the breath will diminish. In very young children, it is necessary to apply the solution lightly, and to limit its application to the diseased surface, for if any roughness is employed and great care is not taken, the healthy parts are irritated, and the soreness and inflammation increased.

The diluted solution for children is generally strong enough;* but this may be left to the discretion of the practitioner, as where the throat is dark and much implicated, I should not hesitate to employ the pure solution (Liq. Ferri Perchlor., B. P.).

In cases, however, where the jaws are stiff from the swelling, or the child resists obstinately, or is exhausted, it is perhaps better to desist from local interference with the throat. If a case of this difficulty presents itself, the carbolic acid spray is one of the best applications. When foul secretions collect about the fauces, and cannot be thrown off by any efforts of the little patient, the spray ought to be employed. It both cleanses and disinfects. As it is of the utmost importance that the patient should breathe as pure an atmosphere as possible, it is evident that if the air becomes contaminated before it reaches the lungs (as it will do if the throat is covered with decomposing secretions) the child's life is placed in still greater jeopardy. The vulcanite spray producer, as sold by surgical instrument makers, is of great service in all inflammatory or irritative affections of the throat, larynx, and bronchi. It is easy of application, and causes neither pain nor inconvenience. It acts directly on the diseased tissues, and penetrates deeper than any gargle or other similar mode of application. I give preference to carbolic acid, but other medicinal agents may be used. In cases of throat affection due to the exanthemata, I have seen excellent effects follow the use of the spray vaporiser—the respiration and the power of swallowing rapidly improving, and patches of slough and exudation expectorated. In young children I have on several occasions known life saved by it. Three or four inhalations may be used in the space of twenty-four hours, and the strength of the liquid may vary from one in twenty to one in forty. For fear of fatiguing the child, each application should not exceed three or four minutes. Soon after its use I have known a child, previously on the verge of coma and breathing rapidly, wake up lively, and from that time improve, till a repetition of the same application was demanded by a relapse of the symptoms.

For the nasal discharge, any of the astringent washes used for the throat, or some antiseptic, or a solution of nitrate of silver—

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* Form. 10:
℞ Liq. Ferri Perchlor. ʒj
Glycerini
Aquæ āā ʒss
M. Fiat Solutio.

(gr. j or gr. ij to ℥j of water) should be thrown up the nostrils with a syringe every four hours.

In *Scarlatina Maligna* the treatment must be of a supporting character from the first, and ammonia, bark,[*] iron, port wine, and brandy are required to be given freely. There is here a tendency to failure of the heart's action, either from debility and exhaustion, or from fibrinous deposit in its cavities.

Sir Thomas Watson recommends in scarlet fever a chlorine drink, now well known to the profession. It is composed of eight grains of chlorate of potash, one drachm of hydrochloric acid, and one pint of water. A child ten years of age may have it rather more diluted, and take half the quantity during the day. The chlorine possesses disinfecting properties, and the solution renders the foul secretions which collect upon the fauces less noxious and hurtful, and the tongue becomes clean and moist.[†] Or the following mixture may be used:—Put an ounce of chlorate of potash and the juice of two moderate-sized lemons into an ordinary wine bottle, and fill up with water. A wineglassful may be given, or taken, two or three times a day by the patient and by those in attendance.

For the dropsy that follows scarlatina, warmth and a milk diet are to be adopted. An occasional aperient of compound jalap powder in the morning, and small doses of tincture of digitalis with acetate of potash during the day should be given if the urine is scanty and high coloured, or contains any blood. If there is pain in the loins, leeches should be applied to combat the nephritis, followed by a large poultice. The vapour bath is sometimes very serviceable.[‡] When the urine is clear, though albuminous, and the febrile symptoms have departed, the tincture of perchloride of iron (Form. 53) should be given, and if the child loses flesh, and there is no sickness or diarrhœa, cod-liver oil will be a useful adjunct. For the effusions that are liable to occur in the pleural or pericardial cavity, diuretics and tonics are to be employed, and all those remedies which encourage the action of the excretory organs, and improve the quality of the blood at the same time. When an attack of scarlet fever and its consequences have passed away, the patient should wear flannel next the skin, and go to the seaside for change of air. However well a child may be going on after a severe case, a month or six weeks ought to elapse before it goes out of doors, and even then the weather should be considered.

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[*] Form. 11:

℞ Amm. Carb. gr. viij
Tinct. Cinch. Comp. ʒij
Syr. Aurant. ʒiij
Aquam ad ℥iv.
} M. A dessert or tablespoonful every four hours.

For a child four or five years old.

[†] 'Principles and Practice of Medicine,' 4th edit., vol. ii, p. 910.

[‡] See Chap. XXIII, "On Acute Desquamative Nephritis." In the 'Practitioner' for August, 1876, Dr de Haviland Hall has recorded an interesting case of acute desquamative nephritis following scarlet fever, in which the patient, a boy nine years of age, passed no water for fifty hours after admission, and from his mother's account very little had been passed previously. The entire absence of any of the symptoms of uræmia in the case was attributed in part to the fact that all articles of nourishment, except a little milk and a free supply of water, were withheld. The only medicinal treatment was a dose of Pulv. Jalapæ Co. and a drachm of bitartrate of potash as a drink.

For many months after an attack of scarlet fever, and it may even be for an indefinite time, there will be observed in some cases, especially those marked by anæmia, a faint and persistent trace of albumen, with no other morbid change in the urine, as tube casts or renal epithelium. This condition awakens some anxiety, though it may continue for twenty years without any manifest impairment of the general health. When anæmia is present, I strongly advocate the steady use of the tincture of the perchloride of iron, and in some instances, where renal congestion is easily provoked, the addition of gr. $\frac{1}{24}$ of perchloride of mercury three times a day. When the diet is carefully regulated and cold avoided, perfect recovery may take place, but there will be no chance of this, unless stimulants are prohibited, and milk and white fish take the place of meat.

Isolation of the patients suffering from scarlet fever is one of the chief circumstances to be borne in mind in order to prevent its extension. The apartment in which the sick person is confined should be well ventilated, and curtains, carpets and all unnecessary articles of furniture should be removed. The bed linen, and that worn by the patient should be changed daily, and placed at once into a deep common hip bath, under water, so that the desquamating epidermis may be less likely to propagate infection. I recommend a weak solution of carbolic acid to be thrown into the bath, and two or three saucers containing it to be put in the sick room, and various parts of the house. I also insist on the importance of adding disinfectants to the evacuations, and getting rid of them directly. With these precautions I have often known the disease not to spread. Infection persists so long as there is the least trace of desquamation, and to ensure safety, isolation should be enforced for at least a week after the last particle of exfoliated cuticle has been detached.

Dr Wm Budd's* directions for limiting the spread of the disease are well known to the profession. His paper is so full of interest, and his directions so eminently practical, that I shall quote the chief precautions which he enforces.

1. The room is to be dismantled of all needless woollen or other draperies, which might possibly serve to harbour the poison.
2. A basin charged with chloride or carbolate of lime, or some other convenient disinfectant, is to be kept constantly on the bed, for the patient to spit into.
3. A large vessel, containing water impregnated with chlorides or with Condy's fluid, should always stand in the room, for the reception of all bed and body linen immediately on its removal from the person of the patient.
4. Pocket handkerchiefs are proscribed, and small pieces of rag are used instead for wiping the mouth and nose. Each piece after being once used is to be immediately burnt.
5. As the hands of nurses of necessity become frequently soiled by the specific excreta, a good supply of towels and two basins, one containing water with Condy's fluid or chlorides, and another plain soap and water, are always to be at hand, for the immediate removal of the taint.
6. All glasses, cups, or other vessels, used by or about the patients, are to be scrupulously cleaned before being used by others.
7. The discharges from the bowels and kidneys are to be received *on their very issue from the body*, into vessels charged with disinfectants.

Dr Budd considers that by these means the infectious power of the germs is destroyed as they emanate from the skin, the surface of which is so extensive, that the poison escaping by it is far greater than that which is cast off by all the other surfaces of the body combined. An impalpable powder armed with the subtle poison of scarlet fever, floats in the atmosphere and conveys infection to any person who may be within the sphere of its influence. To prevent the escape of those particles from the body and carrying the poison far and near, Dr Budd strongly advises anointing the body and scalp with olive oil impregnated with camphor twice a day. As soon as the skin begins to peel (and this is sometimes as early as the fourth day) the oiling should be commenced, and continued till the patient is well enough to take a warm bath, when the whole body and head should be well scrubbed with disinfecting soap (Calvert's or McDoughall's). The baths are to be repeated every other day until four have been taken, when, if the patient has new clothes, and there is no throat or kidney complication, he may return without risk to his family in a week or ten days. After this the sick room should be well fumigated, and the bedding or curtains exposed to a high temperature (240° or 250°), which is said effectually to destroy the power of the specific poison. The principles advocated by Dr Budd apply to all contagious fevers, as smallpox, measles, typhus, &c., and the method employed has proved so successful in his hands, that, during a period of twenty years, he had not known the disease to spread beyond the sick room.

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* "Scarlet Fever and its Prevention," 'Brit. Med. Journ.,' 1869, vol. i, p. 23.

"Hanging rags steeped in disinfectant solution about the room is not to be commended, but a sheet moistened with a strong solution of chloralum, carbolic acid, or Condy's fluid, and suspended outside the door of the room, is very necessary to complete the isolation of the patient . . . . Care must also be taken in using different disinfectants that they do not counteract each other; for example, carbolic acid decomposes Condy's fluid."*

The prophylactic powers of belladonna, which have been vaunted for preventing an attack of scarlatina, are so fanciful, that I do not attach importance to the statements that have been made in favour of it.

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* 'Handbook of Hygiene,' by Dr Wilson, 2nd edition, 1873, p. 304.

SCARLATINA, MEASLES, AND RÖTHELN.

CHIEF CHARACTERS OF THE THREE DISEASES

	SCARLATINA.	MEASLES.	RÖTHELN.
Incubation period before eruption.	From four to six days.	Fourteen days.	Ten to fourteen days.
Premonitory fever, duration of.	Eruption appears on second day.	Seventy-two hours.	Twenty-four hours; sometimes rash is the first symptom.
Character of rash.	Red diffused points at first, followed by a bright scarlet rash, or in patches; first on face and neck, then on thorax, gradually spreading downwards; brightest on covered parts.	Minute red points, resembling flea-bites in first instance; they afterwards coalesce and form irregular-shaped or crescentic patches of a raspberry hue; livid or black in "morbilli graviores."	At first rash is like measles, and later on like scarlatina.
Duration of eruption.	Remains bright for three days, begins to disappear on the fourth day, and is nearly gone on the fifth day.	Remains out for three days, and then begins to fade.	In mild cases, continues four or five days; in bad cases, six to ten days.
State of fauces and tongue.	Inflamed and ulcerated tonsils, difficulty in swallowing, tongue loaded, with prominent papillæ seen through it "strawberry-like."	Slight soreness of throat; tongue covered with creamy fur.	Redness of fauces and swelling; tongue red at tip and edges, but not in all cases.
General symptoms.	Temp. very high, much fever, frequent pulse, headache, thirst, nausea or vomiting, delirium in the severe forms.	Rigors, nausea or vomiting, swelling of face, itching, redness of eyes, coryza, cough, catarrh.	Temp. does not usually exceed normal; slight cough, sneezing, sore throat, enlarged tonsils, shivering; rarely vomiting.
Desquamation.	Copious, the cuticle being thrown off in large patches, especially from hands and feet.	Moderate, the cuticle coming away in fine bran-like scales.	In majority of cases, no desquamation.
Sequelæ.	Anasarca most constant, swelling and suppuration of cervical glands, otorrhœa, pericarditis, pleurisy, chorea, enlarged tonsils.	Bronchitis, pneumonia, pleurisy, tuberculosis, cancrum oris, strumous ophthalmia, chronic diarrhœa, otorrhœa.	Very rarely albuminuria or dropsy; suppuration of cervical glands.

CHAPTER X

VARIOLA OR SMALLPOX

THREE PRINCIPAL VARIETIES GENERALLY DESCRIBED—1. *Variola discreta or distinct smallpox.*—2. *Variola confluens or confluent smallpox.*—3. *Variola hæmorrhagica.*—1. *Variola discreta has three distinct stages*—(1) *The stage of incubation*—(2) *The stage of eruption*—(3) *The stage of desquamation.*—2. *Variola confluens ushered in with more severe constitutional symptoms, and irregularity in the appearance of the rash—Contents of the pustules and occasional implication of the cellular tissue beneath—Danger of the secondary fever and affection of the throat and salivary glands.*—3. *Variola hæmorrhagica or black smallpox, met with during the prevalence of a severe epidemic—Varioloid or modified smallpox; its symptoms and general character.*—CAUSES—*Smallpox due to a specific poison from a person infected with it, and communicable by inoculation.*—PROGNOSIS AND COMPLICATIONS—*Mortality and morbid appearances found after death.*—TREATMENT—*Importance of keeping the apartment cool and well ventilated—Value of disinfectants—Use of emetics and purgatives in the early stages—Remedies for the relief of itching and local irritation—Management of restlessness and delirium—Local inflammation and collection of matter—Applications to the throat and fauces—Frequency of boils—Diarrhœa—prevention of pitting—Ophthalmia.*

SMALLPOX is a highly contagious febrile disease, following a definite and uniform course, which, after a latent period, passes through the stages of pimple, vesicle, pustule, and scab. Since the introduction of vaccination this disease has become comparatively rare; and, if this preventive measure is efficiently carried out, there is every reason to hope that it will gradually become exterminated. In this country it is compulsory to vaccinate by the third month, and as very young children are especially subject to the disease, and it spreads with alarming force, the law cannot be too stringently observed where the health is good. Older persons who have been successfully vaccinated are in a great degree exempt from the disorder, and they may enjoy immunity from it, if re-vaccinated when growth is completed, or when an epidemic prevails. When a person who is unprotected by vaccination is exposed to the contagion of smallpox, he may contract the most malignant form according to the state of his health, and the type of the disease that prevails. Three varieties of smallpox are usually described—

1. *Variola discreta, or distinct smallpox.*
2. „ *confluens, or confluent smallpox.*
3. „ *hæmorrhagica.*

1. *Variola discreta,* or the milder type, has three stages like other exanthematous affections. (1) The stage of incubation. (2) The stage of eruption. (3) The stage of desquamation.

1. *The stage of incubation.*—Fourteen days usually elapse between the time when the poison is received into the system and the appearance of the eruption.[*] Two days preceding the eruption the constitutional symptoms are marked by a rigor, severe headache, loss of appetite, and thirst, but they are sometimes overlooked, and in a few instances I have seen children brought for an opinion about the character of a smallpox eruption which covered the face, and caused but little derangement in the general health. There is usually the history of a day's malaise before the spots appear, and where a child is seen during this doubtful period, there is always such rise of temperature as warrants rest in bed, and a cautious diagnosis. Generally some symptoms of gastric disorder precede the outbreak of the exanthem, as a thick coated tongue, vomiting, and irregularity of the bowels; pain in the back and loins, constantly observed in adults, cannot be ascertained in young children, as if the question is put they are certain to complain of it. At this time the accompanying febrile excitement is always shown by the clinical thermometer. Then disturbances ensue in the nervous and vascular system; the skin feels hot and pungent, and there is headache and restlessness—headache is a constant and severe sym-

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[*] In three cases mentioned by Dr Murchison, the incubation-period, dating from the time the poison entered the system till the first symptoms appeared, was thirteen days in two cases, and eleven days in one case, so that the latent period is subject to variation, as it is in all of the infectious diseases. Of eighteen cases the shortest incubation-period was five days in one case, eleven days in five cases, and thirteen days in one case.—"Observations on the Period of Incubation of Scarlet Fever, and of some other Diseases," 'Clin. Trans.,' 1878, p. 238.

ptom. Sometimes there is delirium or convulsions, and a torpid or even comatose condition, from which it is not easy to rouse the child. The pulse is quick and full, 120 to 140, and towards evening the febrile exacerbations become greater. The temperature rises to 104° or 106°, the eyes are suffused and heavy, and then the eruption makes its appearance, which occurs earlier in severe than in mild cases. The maximum temperature is reached when the eruption is first felt. Sometimes a roseolous rash precedes the characteristic eruption, which has received the name of "roseola variolosa," and then it may be impossible to diagnose it from measles.

The eruption first shows itself on the face, in the form of small red elevated papules resembling measles. Soon an elevation takes place in the centre by the development of a small tubercle, and by the second day it attains the size of a pin's head, and imparts a feeling of small shot to the finger. On the third day it is as large as a lentil and extends over the rest of the face and neck, to the shoulders, trunk, and extremities. The eruption is darker and most abundant where the parts are exposed and uncovered, and on protected parts as the body or feet it is of a light rose colour. About the fifth day a small vesicle containing a clear fluid forms on the top of each pimple—it is tense, like a small blister, but soon becomes depressed in the centre, with an inflamed areola or base surrounding the elevated pimple. All the points or papules do not pass through the same process of change, as some of them never reach the stage of maturation, but pass away in the course of a few days, especially on the legs and feet. The excitement and inflammatory fever now quickly subside, the pulse is reduced in frequency, the secretions become more natural, and the cerebral disturbance passes off. On or about the sixth day there is soreness and swelling of the throat with difficulty in swallowing, and the rash and small circular white spots may be seen on the fauces. This does not occur in all cases. The throat is sometimes free, though the attack is a severe one. The face and eyelids swell, so that the features of the patient are no longer to be recognised. On or about the eighth day the central depression disappears, and the contents of the vesicles become purulent, the redness of the areola is more extensive, and the face more swelled and bloated. In cases that pursue a satisfactory course, a brown spot forms in the centre of the pustule, which attains its full size by the ninth day, the areola around the base becomes less inflamed, and the puffiness of the features disappears. At the same time the face and hands begin to swell. The pustules now rupture and the escape of their contents dry up into scabs, which fall off in the course of four or five days, beneath which the skin is of a purplish colour, which lasts for a considerable length of time. The bursting and desiccation of the pustules begin first on the face, and gradually pass downwards to the trunk and extremities. Scratching the surface prevents children from giving the pustules a chance of drying up without bursting. The swelling of the hands and feet passes off, and the patient is convalescent by the seventeenth or eighteenth day. If the case is a severe one, and the child has not been vaccinated, a permanent depression or scar is left in the skin, marking the situation of each pustule. This becomes covered with a new epidermis, and the cicatrices appear very marked in children, but as they grow older, the skin being thin and elastic, the depressions are not so apparent. About the eighth day, when the vesicle has become pustular, a secondary or suppurative fever appears; the face is more swelled and inflamed, the pulse is quick and weak, the tongue inclined to dryness, and the temperature considerably elevated.

The urine is scanty and high coloured[*] and the bowels constipated, so that the little patient becomes restless, or even delirious at night; the surface itches to such an extent that the child scratches and tears open the pustules unless the greatest precautions are taken.

2. *Variola confluens or confluent smallpox.*—This variety of the disease is more severe than that just described. It sets in with more severe rigors, with fever, headache and delirium. The secondary fever is also of a typhoid character, and there may be coma and jactitation. The rash does not appear with the regularity of the milder affection; a red erythematous blush appears on the skin, and on the second day, small red points may be seen, and the pustules are not distinct but run together and are flat. They often contain a thin, brownish, ichorous discharge, instead of purulent matter. The cellular tissue beneath may be involved in severe

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[*] The urinary secretion in the eruptive and suppurative stages may contain traces of albumen, which indeed is common to these periods in some other of the exanthemata. Becquerel states that it is normal during desquamation, but in the putrid form of the disease "it is decomposed and ammoniacal," and may sometimes contain blood. But this is simply due to the hæmaturia, which we have seen to be common when the poison is of a very malignant character, and is part of the same condition which produces ecchymoses of the conjunctivæ and petechiæ on the skin.

inflammation and sloughing, and the swelling of the face and salivation begin early in the disease. The secondary fever is much more dangerous than in the first form, and quickly assumes a typhoid character. The eruption is dark and livid, and petechiæ are common, as well as hæmorrhages from the mucous surface of the bowels or bladder. The exhaustion increases, and the patient perhaps dies convulsed, or in a state of coma. In cases of recovery the cicatrices are deeper, and the deformity greater. In one case of extreme severity that came under my care some years ago, the outline of the nose was completely effaced, and the eyelids infiltrated with serum and covered with pustules. The fauces, mouth, and nose were similarly affected, and the tongue was so swelled that it could not be retained within the mouth. The neck and cervical glands were swollen, and viscid saliva was constantly pouring out of the mouth. This distressing condition had only lasted a few hours, when, in making an ineffectual attempt to swallow a little fluid that had been put into the mouth, the patient was seized with suffocative symptoms, and died instantly.

3. There is yet another variety termed *Variola hæmorrhagica* or *black smallpox*, which is occasionally met with in severe epidemics. Bright red petechiæ occur upon the skin about the size of a pin's head coincident with the appearance of the papules, which become darker and of a purple hue on the third or fourth day of the disease, when a spot of purpura or of hæmorrhage occupies the pustule. White pustules may be seen on the fauces and palate. Hæmorrhage from the mucous suface of the vagina, bowels, and urinary passages (hæmaturia) distinguish the disease. The mind is collected, and death occurs on the third or fourth day of the disease. Congestion of the chief internal organs is seen in the lungs, mesenteric glands and spleen, and ecchymoses, like the petechiæ on the skin, are scattered over the intestines. Soft clots are found in the right side of the heart, while the left is empty. These cases are rare, but they occur in every severe epidemic, and when once seen cannot readily be mistaken, though they may be overlooked, in consequence of death happening before the rash is well developed.

Varioloid or modified smallpox is the term used when the disease happens a second time, or the patient has been protected by vaccination. The fever lasts only a day or two, and the eruption appears in the morning, the general health being slightly deranged the day before. A few scattered pimples appear on the forehead, face, and nose; some of them become vesicles and others shrivel up, whilst on different parts of the body they present various stages of imperfect development.

The rapid fall of temperature on the second or third day as the rash appears, distinguishes it from scarlet fever and from measles. Unless the rash is extensive there is no secondary fever.

The cause of smallpox is due to a specific poison from a person labouring under the disease, or from clothes left off by the sick and worn by the healthy. It is conveyed by the atmosphere, and is caught from vehicles in which diseased persons have ridden. It may be communicated by inoculation or the scabs from the sick. It is probably communicable when the initiatory fever begins, and may be given by the breath of the patient before the eruption appears. As long as any dry scabs are adherent to the body, the disease is infectious, and breathing the air contaminated by it is enough to propagate it. For several days after death the dead body has been known to communicate the disease, and it is not improbable that it may do so for many weeks and months.*

Smallpox seldom attacks the same person a second time, not one per cent. being liable to a recurrence of it. The disease may attack the fœtus in utero.

As to the prognosis of the disease, it is favorable in the vaccinated, if three or four good vaccination marks remain, if the disease is mild and distinct, and if the children are strong and healthy. It is unfavorable if vaccination have never been performed, or if there be only one or two faint marks of a single vaccination; if the symptoms assume a confluent form, and the pustules are dark and flattened. A sudden disappearance of the rash, with prostration of the strength, and a rapid feeble pulse, are indications of danger; and where they are present the typhoid state continues, and leads to death by syncope, convulsions, or coma. Inflammatory affections of the brain, pneumonia and suppuration of some of the viscera, are among the modes of fatal termination.

Death most commonly occurs in smallpox after the primary fever, and seldom before the twelfth day—the most frequent complications are meningitis, and affections of the thoracic organs, severe diarrhœa, and lesions of the intestinal canal, and, according to Vogel, gangrene of the mouth is sometimes present.†

The mortality from this disease increases with age, while it is very fatal at the extremes of life.* Much will depend upon the age and constitution of the child, and whether it has been previously vaccinated or not. Where it is neglected, the child gets a severe attack, and, if it recovers, bears through life the most disfiguring cicatrices. In the case of a mother and child, who came under my notice some years ago, the former, who was protected by vaccination, had only a few small spots on her face, and made no complaint of her health beyond slight lassitude and disordered digestion; whilst the latter, who was four months old, and suckled by the mother, had her face covered with the eruption, and the body and limbs were also much involved. The child recovered, but to this day the face is frightfully pitted by the numerous cicatrices.

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* 'Reynolds' System of Medicine,' vol. i, 2nd edit., p. 242.

† 'Diseases of Children,' p. 491.

Of the morbid appearances found in those who have died of smallpox, evidences of inflammation are met with in the intestinal canal, the bronchial tubes, and various parts of the brain, in consequence of a deteriorated state of the blood, which is found liquid, dark, and uncoagulated. Universal congestion of the internal organs is also present, and the liver, spleen, and kidneys contain a great deal of blood. The brain and membranes are congested, and the sinuses full of blood. Pustules or false membrane may be seen in the mouth, tongue, fauces, and pharynx, and throughout the œsophagus to the rectum, beneath which the membrane is inflamed and vascular. Evidence of inflammation in the interior of the heart and pericardium is also to be noted, and a change in the muscular structure leading to granular or fatty degeneration.

Treatment.—There is no disease in which it is more necessary to keep the apartment cool and ventilated. In the winter season of the year there should be a fire in the room, and the windows open from time to time, and so managed, that the patient may not be exposed to draughts of cold air. In the summer when the weather is hot or sultry, the windows should be opened at the top, and curtains and carpets be removed. Disinfectants, in the shape of carbolic acid, Condy's fluid, or chloride of lime, should be placed in saucers, and put in the room and passages of the house. All these important precautions ought to be strenuously enforced.

Before the eruption makes its appearance the treatment should be directed to moderate the fever and subdue the nervous excitement. To attain this object an emetic may be given, followed by a mixture of sulphate of magnesia with nitrate of potash (Form. 8), or infusion of senna, to control the fever and open the bowels freely. If the child is strong and there is constipation, a grain or two of calomel, followed by a draught of sulphate of magnesia and senna, should be ordered. In mild cases a dose of castor oil, or a draught of rhubarb and magnesia, will be sufficient to clear the bowels of any irritant matters.

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* "According to Dr Marson, patients of all ages die at the rate of 50 per cent. in the confluent, and 8 per cent. in the semi-confluent, and 4 per cent. in the discrete variety."—*Hooper's Physician's Vade Mecum.* Dr Guy and Dr Harley. Article, "Variola," p. 305.

The diet should consist of milk-and-water, and the patient be kept at rest in bed. If the disease happens in hot weather, and there is much thirst and soreness of the throat in swallowing, weak tea and milk with toast will be sufficient nourishment for a day or two, and grapes, strawberries, and iced lemonade may be taken freely. Raspberry vinegar is an excellent drink, and relished by all patients.

During the period of eruption and maturation the measures to be employed are much the same; and if there is restlessness and irritation of the skin, it is a good plan to use a warm bath, to which oatmeal or carbonate of soda is added. If itching and irritation of the face are severe, it should be smeared over with olive oil, or olive oil to which carbolic acid (1 in 40) is added, or glycerine, or zinc ointment. Pork lard melted in a saucer and applied to the face allays irritation in a remarkable manner. If the strength appears deficient it must be supported by suitable nourishment, as beef tea, chicken broth, and so forth. When the fever subsides, a stimulating diaphoretic may be given.[*] If the child is restless at night, bromide of potassium or hydrate of chloral at bedtime should be employed; for if the patient cannot obtain sleep he will become exhausted, and the restlessness will increase. Opiates, however, must be used with great caution. For the delirium which arises in the course of smallpox, care should be observed in noticing whether it is due to a plethoric state, with a full pulse and active cerebral excitement, or whether the child is weakly and delicate, and the pulse quick and running, so that each beat is not appreciably distinct. In the former case cold sponging or ice to the head may be required; in the latter case stimulants and nourishment, with quinine if the temperature be high, are the only remedies to subdue it.

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[*] Form. 12:
℞ Liquor Amm. Acet. ℥ss
Spt. Æther. Nitr. ʒj
Syr. Rosæ ʒiij
Aquam ad ℥iv.
M. A tablespoonful every four hours.

Form. 13:
℞ Amm. Carb. gr. viij
Liquor Amm. Acet.
Syr. Aurant. āā ℥ss
Aquam ad ℥iv.
M. A tablespoonful every four hours.

For children five years of age.

Local inflammation must be treated on general principles. Where collections of matter form, whether in the cellular tissue or under the scalp, they should be opened early to prevent their spreading, and cavities may be washed out with carbolic acid lotion (1 in 40), or nitrate of silver (gr. x to the ℥j). The discharge from the pustules in severe cases is very irritating, and causes much discomfort. To meet this the linen cannot be too frequently changed, and oxide of zinc and starch in equal proportions, or calamine powder and oxide of zinc, or flour, or some of the toilet powders in use, may be dusted over the body from a common dredger. For the vomiting which sometimes occurs, iced water or prussic acid is useful, and if the child is old enough, an effervescent mixture, and a poultice to the epigastrium. If the throat is much swollen two or three leeches may be applied, and afterwards a poultice. Mopping out the throat with a weak solution of nitrate of silver, or the infusion of roses with sulphuric acid, is also to be recommended.

Boils frequently result from smallpox, and they are tedious to heal. The discharge exhausts the patient and prolongs his convalescence. When this complication has arisen quinine and bark will be required to support the strength. The mineral acids with tincture of gentian often answer well, and the wounds should be dressed with some stimulating ointment. If sloughing takes place, a carrot or a linseed poultice should be applied, and the free use of carbolic acid or Condy's fluid should not be omitted.

When the eruptive fever has passed away, and there are languor and clammy skin, the mineral acids with bark or calumba will be serviceable.* When the strength begins to fail tonics and stimulants will be needed. Quinine and ammonia are the best, and wine and brandy according to the exigencies of the case.

In the hæmorrhagic variety of the affection, the free use of stimulants, and supporting measures of all kinds are demanded. In the shape of medicine some styptic preparation of iron, as the tincture of perchloride, should be given to restrain the hæmorrhage.

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* Form. 14:
℞ Acid. Nitric. Dil.
— Hydrochl. Dil. āā ʒss
Tinct. Cinch. Co.
Vel — Calumbæ ʒiij
Syrup ℥ss
Aquam ad ℥iv.
M. A tablespoonful three times a day.
For children five years of age.

When diarrhœa is excessive it should be checked by Krameriæ,* small doses of laudanum, or the Pulvis Cretæ c. Opio.†

The prevention of pitting is no insignificant part of the treatment. The parts affected, particularly the face, should be protected from the air, and the lymph let out from the distended vesicles by a needle, and absorbed by cotton wool. The top of each pustule is to be lifted up, and a thin point of nitrate of silver applied to the base. If the remedy is to be successful it is to be applied on the second or third day of eruption, and, though it causes some pain, it soon passes off, and diminishes the swelling and tumefaction of the pustules, and prevents cicatrices. Of the application of mercurial ointment to prevent pitting, Rilliet and Barthez state that it was successful even in cases of confluent smallpox, and that when applied on the first or second day it prevented the development of the eruption, and caused an abortion of the pustules. To protect the skin, collodion may be applied, or still better, the flexible collodion made of collodion, castor oil, and Canada balsam.

The plan adopted at the Smallpox Hospital is as follows:—

"Wait until the pustules have discharged, and the discharge has begun to dry, then put on some of the best olive oil, or a mixture of one third glycerine and two thirds of rose water. Some of this may be applied once or twice a day, for a few days, until the scabs begin to loosen. Cold cream and oxide of zinc, or olive oil and lime water, form good applications; or if the discharge is thin and excoriating, calamine mixed with olive oil. The patient should be warned not to allow the scabs to dry and remain some time on the nose and other parts of the face, particularly on the forehead and near the end of the nose. When this takes place, the dry scabs themselves leave deep marks in the skin, worse than the eruption of smallpox itself. The pain of removing the dry scabs is sometimes considerable, and the patient can hardly be prevailed to take them off, or allow others to do so. In common the pits from the eruption are not deep at first, just after the patient has got well, and we may deceive ourselves by thinking our efforts to prevent disfiguration have been attended with considerable success. The disease leaves a peculiar brown stain on the skin at first, which soon wears off, but the pitting is more perceptible a twelvemonth or so after the patient has got well."[*]

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* Form. 15:
℞ Tinct. Krameriæ ʒij
— Opii ♏xij
Spt. Chloroform. ♏xvj
Syr. Zingib. ʒiij
Aquam ad ℥iv.
M. A tablespoonful after each action of the bowels.

† Form. 16:
℞ Pulv. Cretæ c. Opio ℈ij
Tinct. Catechu ʒij
Aquam Menth. Pip. ad ℥ij.
M. Two teaspoonfuls after each action of the bowels.

For children five years of age.

If the ophthalmia is severe two or three leeches to the temples may be necessary, and in milder cases a solution of nitrate of silver (gr. j to gr. iv to the ℥j). When the eyelids are swollen and œdematous, and the lids stick together by a tenacious secretion, they should be bathed frequently with warm water and a little Ung. Cetacei, or diluted yellow oxide of mercury ointment (Hyd. Oxy. Flava gr. viij, Vaseline ℥j) applied to the edges of the eyelids night and morning. When ulcerations of the corneæ ensue, it has been recommended to touch them with a sharp point of nitrate of silver, or a collyrium of sulphate of zinc and opium may be used.[†] Meigs and Pepper speak highly of a collyrium of borax and sulphate of zinc.[‡]

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[*] "Smallpox," by J. F. Marson, 'Reynolds' System of Medicine,' 3rd edit., vol. i, p. 262.

[†] Form. 17:
℞ Zinci Sulph. gr. ij
Vini Opii ♏xx
Aquam Rosæ ad ℥j.
M. Fiat Collyrium.

[‡] Form. 18:
℞ Sodæ Biborat. gr. xij
Zinci Sulph. gr. j
Aquæ Camph. ʒj
Aquam destill. ad ℥j.
M. Fiat Collyrium.

CHAPTER XI.

DISEASES OF THE MOUTH AND FAUCES.

STOMATITIS AND ITS VARIETIES.—*Stomatitis simplex, or simple inflammation of the mouth—Symptoms—Causes and treatment.—Stomatitis follicularis (Vesicular stomatitis—Aphthous stomatitis)—Symptoms—Causes and treatment.—Stomatitis fungosa—Aphthæ—Le Muguet—Thrush or white mouth—Diffuse inflammation of the mouth—Symptoms and treatment—Value of chlorate of potash.—Ulcerative stomatitis—Character of the ulceration—Local and constitutional causes—Treatment—Chlorate of potash—Bark—Iron—Cod-liver oil—Local application of nitrate of silver—Hydrochloric acid—Gangrenous stomatitis—Gangrene of the mouth—Cancrum oris—Symptoms—Pathology and treatment—Caustics—Chlorate of potash—Wine.—Mercurial salivation—Rare in children—Treatment.—Gingivitis.—Acute tonsillitis.—Hypertrophy of the tonsils.—Simple pharyngitis.—Retro-pharyngeal abscess.—Cynanche parotidea, or mumps.*

INFLAMMATION of the mouth is a troublesome and painful disease in infants and young children. Although extremely common during the period of dentition it may occur at almost any age. In one variety the inflammation does not extend through the mucous membrane, or, at the worst, it produces a number of small, circular, irritable ulcers, with a red margin surrounding a depressed centre, whilst in another the ulceration involves the gums and the mucous membrane more deeply, and in a third, swelling and gangrene attack the cheek, and destroy the life of the sufferer.

Stomatitis simplex, or inflammation of the mouth, is a mild affection, causing trifling constitutional disturbance, and, except under neglect, rarely leading to ulceration. It is common among the infants and suckling children of the poor during the first year of life, involving a portion, or sometimes nearly the whole mucous membrane of the mouth, particularly if the food is taken through bottles and the hygienic conditions are bad. It is rare among the children of the upper classes, unless the nipples of the nurse are sore, or the milk is faulty. In the out-patient department of our hospitals it is very frequent. In its mildest form it is an erythema, but occasionally minute vesicles are seen on the affected membrane, and the lips swell with an herpetic eruption upon them. Sometimes the salivary glands are very active, and saliva dribbles from the mouth. The symptoms are heat and dryness of the mouth, restlessness and feverishness, flatulence and diarrhœa; the mucous membrane presents patches of redness raised above the surrounding surface, which are seen on the inside of the cheeks and the angles of the mouth; they may also be observed on the hard palate and gums, having a yellowish patch of lymph in the centre, with a red margin.

The causes are gastro-intestinal disorder and uncleanliness, and indigestible or irritating articles of food. It is seen in scarlatina and measles, or during dentition, when the gums are irritated by the pressure of teeth, and then the disease is local instead of general. In these cases the gums are often red and spongy, and bleed on being touched.

The disorder usually yields to a regulated diet, a dose of castor oil, or a powder of rhubarb and carbonate of soda. If it does not improve under this treatment, a mixture containing a little magnesia, or the Liq. Magn. Carb. will be useful. Lime water should be added to the milk, and the mouth cleansed after each meal with a piece of soft rag dipped in warm water. If the gums are swollen and distended by the teeth they should be lanced. Occasionally the disorder is kept up till the nurse is changed, and the method of feeding is altered. In one well-marked and obstinate case which came under my notice, the mouth did not take on a healthy appearance till feeding with a spoon was substituted for the bottle and the nurse.

Stomatitis follicularis (*vesicular stomatitis—aphthous stomatitis*) is common with children during the first dentition. Large and distinct pearl-like vesicles of a round and elevated form resembling herpes take place on the inside of the cheeks, lips, sides of the tongue, and more rarely on the gums. When they rupture, a little glairy fluid is discharged, leaving a round and superficial ulcer with a red margin and a yellowish-grey base. The complaint arises from inflammation of the mucous follicles, symptomatic of some intestinal disorder and acidity of the primæ viæ. It occurs during teething, or after whooping-cough or measles, in fact, it may follow any exhausting complaint. There are several of these ulcers which do not usually run together, except the disorder is severe; and although most frequent on the mucous membrane of the cheek, they are sometimes noticeable on the tonsils and soft palate.

Symptoms.—The constitutional disturbance is slight, and there is nothing to notice beyond trifling feverishness, loss of appetite, thirst, and irritability; sometimes there is not even this assemblage of symptoms, and the chief feature is pain, with soreness of the mouth, which prevents the child from taking nourishment. The complaint is of common occurrence in delicate children, and is without danger. The ulcers pass away under treatment in the course of a few days, but are prone to recur from time to time, as in adults, when the digestive functions are deranged. It is important to bear in mind that the disease does not always follow the same mild course. After the bursting of the vesicles, the superficial ulceration that remains may be coated with a similar exudation to that which occurs in thrush, and to be even associated with the formation of false membrane, as in diphtheria. Such cases sometimes follow severe attacks of measles.

Treatment.—An alterative dose of grey powder, soda, and rhubarb is useful, and tonics—bark, with a few grains of chlorate of potash—will bring about a cure. If the mouth is very painful, and prevents the child from taking food or sucking, a weak solution of nitrate of silver may be brushed over the excoriated parts daily, or they may be touched with a piece of alum; a lotion consisting of one ounce of glycerine of borax to five ounces of water is also a simple and useful application.

Stomatitis fungosa—Aphthæ (Underwood and Dewees)—Le Muguet (French)—Thrush or white mouth—Diffuse inflammation of the mouth.—This complaint is met with at all ages, but it is most common in infants and young children, as the result of improper or artificial feeding. The mouth is hot and dry, and the salivary secretion is diminished. Small white conical patches form on the inside of the cheeks, angles of the mouth, and sides of the tongue. After two or three days these elevated patches present a curdy or soft cheesy exudation of false membrane, and may be seen on the pharynx, tonsils, or hard palate, and if removed the surface bleeds, until it is covered by fresh exudation. The patches assume a greyish ragged appearance, leaving an unbroken smooth surface, or a superficial excoriation, which increases the difficulty of swallowing and sucking. The disease may extend into the œsophagus, or the air-passages, and cause cough and expectoration, which reduce the child's strength, and may end in exhaustion and inanition. It is most frequent in infants of two or three months old. The constitutional symptoms are gastric disorder and diarrhœa, with all the symptoms of muco-enteritis; the motions are greenish, mixed with curdy masses of milk, and in this way the disease extends through the whole alimentary tract. The anus is often red and excoriated from the acrid nature of the bowel discharges, and there is erythema of the buttocks and perinæum of the child, and, if of the male sex, the scrotum is sore, excoriated, and inflamed. Febrile excitement is not uncommon, and the pulse is accelerated. This disorder occurs in delicate children who are badly fed and clothed, and is looked upon as serious; but it is simply the local indication of a feeble constitutional condition. It comes and goes, and when seen as the accompaniment of acute or long-standing chronic disease, is of evil augury. The exudation has been seen in the stomach, in Peyer's patches, and in the cæcum. The curdy exudation of thrush has been found to consist microscopically of thickened epithelium cells, mingled with numerous minute cryptogamic sporules or seeds, from which thread-like branching plants arise. This has been named the *Oidium albicans.*

Like the former variety, it is chiefly met with among the children of the poor, and those brought up by hand or suckled too long.

The predisposing causes are attributable to general or local disease, but the exciting cause is owing to a parasitic fungus, as we have just seen, in the mucous membrane. This vegetation is probably derived from some mouldy article of diet, which may spread and be conveyed to the nurse's nipple, and from the latter to the child's mouth.

Treatment.—In every case I would recommend the chlorate of potash, which is a specific; a few grains administered three times a day will have a marvellous effect in curing the disorder. A dose of castor-oil is generally necessary, and the diet must be carefully regulated. The mouth should be washed out after each meal, and a local application of the glycerine of borax be employed; or the affected part may be brushed over with a solution of nitrate of silver (gr. v. ad f℥j). Sir William Jenner recommends a solution of sulphite of soda (ʒj ad f℥j), from the destructive influence which the sulphurous acid has on the fungus.

Ulcerative stomatitis (*Ulcero-membranous stomatitis*, Rilliet and Barthez) is a mild and frequent disorder, but in no way dangerous to life. It is more frequent in hospital than in private practice. It would seem to be an aggravated form of the membranous affection, which either advances to ulceration, or in milder cases is absorbed without proceeding any further. The affected membrane in the first instance is white or dirty grey, or black, and the surrounding membrane swollen and inflamed. The plastic exudation is thick, and is more or less adherent to the tissue beneath, and, if raised, exposes a superficial bleeding ulcer. Even when the exudation is gently removed blood oozes from the exposed surface. The affection is seen to occupy the inside of the cheek, and to extend to the gums of the front teeth, which are swollen and spongy, bleeding on the slightest touch, and, by their retraction, causing the teeth to become loose in their sockets. The cheek and lips in contact with the affected parts likewise become the seat of irregular ulceration, which may prove very obstinate, or degenerate into a more severe form. In mild and favorable cases, the ulcers being superficial rapidly diminish in size and heal quickly, the saliva becomes less in quantity, and the gums take on a healthy appearance. But in some cases the ulcers destroy the gum, and extend deeply, and are very intractable to treatment. They may involve the whole mucous membrane of the mouth, running together and extending to the hard palate; and when the disease is so general, the submaxillary glands are hard, swollen, and painful. The breath is offensive, and the salivary secretion is increased. The subjects of this complaint are delicate children, who have been badly fed and cared for. It is common between the ages of five and ten years, and it often prevails as an epidemic. The scrofulous children of the poor are frequent victims, particularly if their health has been further reduced by eruptive diseases or pneumonia, or if they possess bad teeth. In one case under my care there was an obstinate irregular ulcer on the gum, which had receded from a carious tooth, and it resisted all remedies till the decayed stump was removed, when it took on healthy action. There is generally some febrile disturbance, which continues for a day or two.

In the case of a female child, nine months old, who was shown to me in May, 1877, the ulceration occupied the inside of the lower lip in three distinct patches, the largest being the size of a threepenny piece. The ulceration was not deep nor surrounded by induration of the mucous membrane, which presented no variation from the tint of health. There sprang up from the base of the ulcerated surface long whitish points, like the fungoid excrescences of an open wart. When first seen the affected part presented a pea-like hard body, feeling like a wart. The child was suffering from broncho-pneumonia, chiefly of the right lung, of one week's duration, and the lip became affected on the third day of the attack. The face was pallid, and the lips dusky and separated, the respiration was short and shallow, 60 per minute; the morning temperature 103°, the pulse 112; in the evening the temperature reached 104·2°, and the pulse 120. There was no ulceration in any other part of the mouth, nor any aphthous exudation.

When the exanthematous fevers have altered the quality of the blood, or a young child is struck down by some acute disease with a high temperature, the mucous membranes are prone to suffer, and especially the mouth.

Treatment.—This consists in attention to the general health; the diet should be regulated and the digestive functions attended to. In the shape of medicine, for the relief of the ulcerated mouth, the chlorate of potash is a specific here, as in other varieties of ulceration of the mouth in children. A grain three or four times a day in water for a child a year old, and one additional grain for every year of the child's age up to ten grains will be a suitable dose. A drop or two of the dilute hydrochloric acid, and the addition of the tincture of cinchona, or the ammonio-citrate of iron will bring about a cure in a short time in ordinary cases. Cod-liver oil, quinine, and the syrup of the iodide of iron will be useful. If the ulceration is obstinate, the application of a solution of nitrate of silver to the ulcer, or the hydrochloric acid is desirable. I have often known the gums to take on healthy action at once after an application of nitrate of silver (gr. v ad ℥j), and to be well in a week when chlorate of potash has been given at the same time. As in the sore throat of scarlatina, brushing over the affected part with the tincture of iron and glycerine is a good application.

Gangrenous stomatitis (*Cancrum oris*). This is a serious and rare constitutional affection, attacking children whose blood is deranged, and is a far more important disease than any of the varieties we have hitherto considered. Dr West only saw seven cases, and out of these six died.* Rilliet and Barthez met with a fatality of twenty out of twenty-one cases. It may follow the eruptive fevers (particularly measles), typhoid fever, pertussis, tuberculosis, &c. It is sometimes attributable to the injudicious use of calomel.

Most authorities agree that the disease is most often seen between two and five years, but it may occur to any children up to twelve or thirteen. Like the former disease, it is more frequent in hospital than in private practice. The disease is regarded by most observers as beginning in the mucous membrane of the mouth, with the formation of thick yellow patches of membrane, which terminate in ulceration. A hard swelling also forms, surrounded by a tense infiltration of the cellular tissue of the cheek. The symptoms begin with fœtor of the breath, and a discharge of saliva. The inside of the cheek is tense, hard, red, and shining, and it is usually limited to one side. In the centre is a bright red spot, and the mouth is opened with difficulty. In the centre of the swelling an irregular excavated ulcer forms, the centre of which is covered with an ashy loose slough. The teeth become loose, and occasionally drop out, whilst the alveoli are laid bare, and sometimes become necrosed. As the disease advances, the swelling of the cheek increases, and the central dark spot becomes a gangrenous eschar or slough, and blackened shreds of tissue are cast off. The disease is usually limited to one side of the mouth.

Treatment.—The only reliable means of cure lies in the application of strong hydrochloric acid, or nitric acid, and it is obvious that if such a remedy is to be of service it must be active and applied thoroughly whilst the patient is under the influence of chloroform. It may be necessary to repeat the application from time to time, and the mouth must be washed frequently with Condy's fluid, or a weak solution of chlorate of soda. If the cheek is tender on the outside, a poultice or fomentation will be advisable. Castor oil, chlorate of potash, iron, &c., will be needed. (Form. 9, 10).

Mercurial Salivation.—Mercury, when injudiciously administered, may produce ulceration of the gums, loss of teeth, fœtor of the breath, and salivation, leading to the various forms of stomatitis and gangrene of the mouth; but such cases are very rare, and we look for the influence of the drug in the greenish stools of infants rather than in the excessive action of the salivary glands.* In addition to these symptoms there may be swelling of the submaxillary glands and superficial ulceration upon the gums, which may extend to the cheeks and tongue, giving rise to an ulcerous or gangrenous form of stomatitis. The constitution sympathises in the irritative febrile disturbance, and weeks may lapse before the affected parts resume a healthy state. Children so affected lose flesh and strength, and are peevish and irritable. They are disinclined to take nourishment if the mouth is sore and painful, and that which is swallowed is imperfectly assimilated from the quantity of altered saliva which finds its way into the stomach. "Nearly 30,000 children of all ages have come under my care during my connection with the Children's Infirmary and the Children's Hospital, and I have administered mercury to any of them who seemed to require it, but hardly ever saw salivation follow its employment before the completion of the first dentition; and never observed that medicine, at any age, produced any affection of the mouth sufficiently serious to cause me a moment's anxiety."† When given in a single or moderate dose it would appear to be eliminated by all the secretions, and not a trace can be detected in any organs or tissues. When, however, it is continued recklessly or intentionally for days together, the power of elimination gradually fails, and it accumulates in the body, lessening the amount of fibrine in the blood, and increasing the activity of all the glandular organs. Although the kidneys are the chief channels by which the mercury finds its way out of the system, the drug is also freely excreted by the salivary glands and bowels.

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* 'Diseases of Infancy and Childhood,' 4th edition, p. 532.

Chlorate of potash and sulphate of magnesia are both useful remedies, the former acting upon the mucous membrane of the mouth, and the latter stimulating the action of the bowels. For the soreness of the mouth, a solution of nitrate of silver (gr. v ad f℥j) should be applied twice a day, and every time after taking food, which should consist chiefly of milk; the parts affected should be gently wiped with a piece of soft rag dipped in the lotion of borax before mentioned. The employment of sedatives may be required to allay pain and secure sleep.

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* In some cases of ptyalism, the parotid and salivary glands are said to be swelled and hyperæmic, and the fluid dribbling from the mouths of children may reach many ounces in twenty-four hours. In adults it has been estimated in severe cases at seven or eight pounds. "Lehmann and other observers have found it at first more mucous, cloudy, of greater specific gravity, and richer in solid constituents (young and old epithelial cells) than normal saliva."—*Niemeyer's Practical Medicine*, vol. i, p. 443.

† West's 'Diseases of Infancy and Childhood,' p. 539.

Gingivitis—Odontitis—Inflammation of the gums—Disorders accompanying dentition.—Dentition in most healthy children is attended with redness, heat, and swelling of the gums, which are also tender, and there is dryness of the mouth in some cases, but often a free flow of saliva. There is pain in sucking, when the child attempts to grasp the nipple, which it speedily releases, and cries, and is fretful. When children are strong and full of flesh there is considerable disturbance of the system, and the cutting of each tooth is attended with heat and flushing of the face, sleeplessness, and fever. Cerebral disturbance, or even inflammation or convulsions, are occasionally observed; skin diseases and eruptions about the scalp are common. In rickety children dentition is retarded, and there is no derangement worthy of notice. Some children pass through dentition with little, if any, constitutional disturbance, one tooth after another appearing in regular succession, without pain or irritation of any kind. But it is not so in every case; there are many instances in which dentition is painful, and every new tooth either provokes a short attack of inflammatory fever, diarrhœa, or salivation, or even a convulsion. The gums are red, hot, and swollen, and the child is perpetually putting the fingers in the mouth, and is unable to suck and grasp the nipple; aphthous ulceration takes place, the child is feverish and cannot sleep, and is extremely restless and fretful; sometimes laryngismus or inflammation of the air-passages (bronchitis or pneumonia) springs up, or cutaneous eruptions, as lichen or strophulus. In some children the fretfulness and disturbed sleep are very trying to the parents, and not without anxiety to the medical attendant; the child grows pale and fractious, though the teeth are appearing. It sleeps for a short time, then wakes up flushed and excited, and cannot rest again. The child is uneasy, and puts the fingers to the mouth, cries at any sudden noise, and will not leave the nurse's arms. The nervous excitability is great, and unless the child gets rest, it becomes exhausted, refusing food, and often vomiting the little that is taken; the hands and head are hot, the pulse is quick, and the temperature elevated.

Treatment.—In ordinary cases a simple aperient, the borax lotion, and a few grains of chlorate of potash, will be enough to cure the disease. In healthy dentition, the gum-lancet is often most useful, as we have seen (p. 33), in liberating the tooth, which is pressing against the thin gum; but in the disorder under consideration, the gums are generally inflamed, and an incision would not only be extremely painful, but it may be followed by ulceration along the edges of the cut wound. Some authorities have advised leeches to the gums, or to the angle of the jaw. If the child cannot obtain rest, sleep must be procured, and the nervous irritation allayed. For this purpose, a mixture of bromide of potassium and hydrate of chloral is advisable at bedtime, and it should be repeated if tranquil sleep does not ensue, while the bromide may be given during the day.

Tonsillitis—Cynanche tonsillaris—Quinsy—Causes—Symptoms—Treatment.[*]—This disease sets in with rigors and febrile symptoms, pain in the head, limbs, and back, to which succeed heat and dryness in the throat. Any attempt at swallowing is extremely painful, and the patient feels as though there was a lump in the throat. The voice is thick and guttural, and the tongue is covered with a creamy fur. The pharynx presents a deep reddish tint, and one tonsil is noticed to be more swollen than the other, the disease being usually limited to one side; a patch of lymph is seen coating the affected tonsil, and the act of swallowing causes a darting pain through the ear on the affected side, and throbbing; there is a free discharge of saliva, and liquids return through the nose. The neck below the ramus of the jaw is tender and swollen in some cases, and as the complaint progresses the inflammatory fever increases, till the stage of suppuration is reached, which ordinarily happens in five or six days. The disease generally ends in resolution, the inflammation and infiltration of the affected tissues gradually subsiding; rarely it may go on to suppuration, leaving a deep, ragged, excavated ulcer, or, what is more frequent, it may terminate in chronic inflammation and enlargement.

Delicate children are occasionally liable to the complaint from cold and exposure to draughts of air when the body is heated, as when coming out of a hot and close room.[†]

Treatment.—If there is much tenderness below the jaws, and the little patient feels pain in separating them, two or three leeches will be useful, and a poultice applied afterwards. At an early period, a few punctures with a bistoury guarded with a piece of lint will relieve the tension, and drain the infiltrated tissues; the mouth must be continually washed out with warm water. If there is much febrile excitement, a diaphoretic containing antimony, (Form. 7) or aconite should be given. In the catarrhal forms of tonsillitis, salicylate of soda has been recommended.

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[*] The diagnosis from the throat affection of diphtheria and scarlet fever is considered in their respective chapters.

[†] Of 1000 cases of tonsillitis treated by Dr Morell Mackenzie at the Hospital for Diseases of the Throat, there were only 36 cases from 10 to 15 years of age, and 184 from 15 to 20. The most common period is between 20 and 30; after 25 there is a

In some inflammatory affections of the throat in children, as in tonsillitis and general pharyngitis, half a minim of the tincture of aconite may be given to a child in a teaspoonful of water every hour, or even half hour, with great advantage. But its effects must be watched lest it should depress the circulation too much, or render the pulse unsteady. The remedy will generally convert the dry and hot skin into a sweating one, and control the febrile excitement and restlessness; the pulse loses its hardness, and falls in frequency, the temperature is reduced, and relief follows in a short time. The swelling and congestion of the tonsils diminish, and the mucous membrane of the throat becomes more moist and natural. "If caught at the commencement, a quinsy or sore throat rarely fails to succumb in twenty-four to forty-eight hours."[*] Guaiacum is another remedy which has long enjoyed a great repute in the treatment of this affection. Dr Morell Mackenzie thinks it far superior to aconite. It may be given in the form of powder, four or five grains in a little jam, every six hours, or the Trochisci Guaiaci of the Throat Hospital Pharmacopœia may be ordered.[†]

A grain or two of calomel to stir up the functions of the liver will abate the headache. The patient must be fed with milk and soda water, tea, lemonade and thin water arrowroot, the tartrate of potash drink to keep the bowels free, and beef tea to support the strength. Tonsillitis is soon succeeded by prostration, and quinine and other tonics may be called for at an early stage of the affection.

Hypertrophy of the tonsils may follow acute tonsillitis, but more commonly it is seen in delicate children who are anæmic, rickety, strumous, or afflicted with a syphilitic taint. The disease begins

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remarkable fall. Young children are very little subject to the disease, and before the age of five it is seldom seen ('Diseases of the Throat and Nose,' 1880, p. 49).

[*] 'Handbook of Therapeutics,' by S. Ringer, M.D., 8th edit., p. 441. For fuller information on the action of aconite, see Chap. IX, "On Scarlatina."

[†] 'A Manual of Diseases of the Throat and Nose,' vol. i, p. 57, 1890.

as a chronic affection during the first two or three years of life.[*] The tonsils project in the middle line of the fauces, narrowing the aperture, and interfering with swallowing and speaking. Children so affected sleep heavily at night, with the mouth open, and are restless. They are liable to catarrhal attacks and deafness. If they are young, and the tonsils do not meet, local treatment by nitrate of silver and perchloride of iron may keep the disease in check. As the age advances, and the general health improves, the enlargement under treatment subsides, but in too many cases excision of a portion of the enlarged glands must be resorted to. Cup-shaped depressions in the lower part of the chest wall are frequently observed in children suffering from enlarged tonsils, when they nearly meet, and narrow the entrance for the admission of air to the lungs. These depressions, due to imperfect expansions of the lungs, disappear after excision of the tonsils, by permitting a freer entrance of air to the imperfectly expanded vesicles.[†] The well-known pigeon-breast sometimes arises from chronic enlargement of the tonsils.

Simple pharyngitis, or inflammatory sore throat, is an affection of the tonsils, soft palate, and pharynx, unaccompanied by ulceration or exudation, and is common among children during cold and changeable weather. It is either a simple idiopathic affection, or it occurs as the accompaniment of measles, scarlet fever, bronchitis, pneumonia, croup, and laryngitis. It is much oftener a secondary than a primary disease. The mucous membrane of the parts just alluded to is swollen and slightly red, and a mucous or sero-purulent secretion is seen upon them, particularly the back of the pharynx, which has a red, roughened, and granular appearance. The mucous membrane in the secondary affection is often dusky and purple, and the tonsils are more swollen than when the complaint is idiopathic, and arises from cold and exposure, or from swallowing boiling liquids.

Symptoms.—The complaint begins with disturbed sleep and restlessness; there is febrile excitement, as heat of skin, flushed face, headache, thirst, tenderness over the pharynx, and difficulty in swallowing. The appetite is gone, and the child refuses to take food. The pulse and respiration may be increased in frequency and the temperature reach 100° or more. In very young children there is often croupy cough and bronchial irritation. In one case under my care the tracheal irritation was secondary to the pharyngeal affection, and it travelled down into the bronchi and produced suffocative bronchitis and death. The disease is not dangerous in itself, but from the complications to which it may give rise.

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[*] Of 1000 cases, Dr Morell Mackenzie met with 265 under the age of 10 years, and of these 84 occurred from 1 to 5, and 181 from 5 to 10 (op. cit., p. 61).

[†] "Two Observations on Children," by Norman Moore, M.D., 'St. Bartholomew's Hospital Reports,' 1874, vol. x, p. 130.

The *treatment* consists in applying a piece of linen rag (twice folded) dipped in tepid water to the throat under a piece of oiled silk. If this does not give comfort, and there should be swelling and irritation of the cervical glands, a warm linseed poultice is the best application. In young children I have occasionally mopped out the pharynx twice a day with a solution of nitrate of silver (gr. v ad f℥j), and seen great advantage follow it when the disease has not invaded the trachea. In recent and acute cases, the temperature of the apartment should be warm, and the atmosphere moist. Milk-and-water, weak tea, and mucilaginous drinks should be given as a diet. A refrigerant and saline aperient is usually needed (Form. 8), and diaphoretics and mild sedatives of various kinds are useful (Forms. 7, 12, 76) to calm excitement, subdue irritation, and determine to the skin.

Retro-pharyngeal abscess consists in the formation of matter between the vertebral column and the posterior wall of the pharynx; it is most frequent in infancy and early life. Children of a strumous or tubercular constitution are most liable to the complaint, and caries of the cervical vertebræ, or inflammation of the submucous areolar tissue may provoke the disease.

"The cause is mentioned in twenty cases of the primary form, collated by Dr Allin, as follows:—Exposure to cold, ten cases; lodgment of bone in pharynx, eight cases; blow with a fencing foil one case. In the last case, the button of a fencing foil passed through the right nostril into the pharynx."* Sometimes no cause can be ascertained.

Many writers describe the disease as secondary when it follows the eruptive fevers, as measles and scarlatina, the inflammatory state of the pharynx involving the cellular tissue beneath, and leading to suppuration. It is then regarded as of idiopathic origin. It has also been traced to inflammation of the lymphatic glands, between the pharynx and vertebræ.—(Fleming.)

Symptoms.—The disease generally sets in with fever and restlessness, furred tongue, heat of mouth, difficulty in deglutition, and the impossibility of assuming a recumbent posture. There is also in some cases a stiffness of the neck, and pain in moving the head. As the complaint advances, the respiration becomes laboured, and food cannot be swallowed without pain. Occasionally there is croupy cough. The early symptoms in a strumous-looking child two years of age, which came under the care of Dr Oxley, at the Liverpool Infirmary for Children, were stiffness of the neck, laboured breathing, and a croupy sound on inspiration, but the little patient was able to swallow and cry. Eleven days afterwards a firm elastic swelling nearly filled up the throat. This was punctured with a bistoury, and a large quantity of pus evacuated. The child recovered.*

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* 'Diseases of Children,' by Lewis Smith, M.D., 1869, p. 319.

The abscess can generally be detected on obtaining a view of the pharynx and fauces, when it is seen to push forward the posterior wall of the pharynx against the velum palati, or, if lower down, obstructing the larynx and involving the respiration. The pus may even extend downwards into the pleural cavity, and excite dangerous mischief within the walls of the thorax.

When dyspnœa threatens, there is danger of suffocation, and coughing or swallowing increases the paroxysms; the head is thrown back and the patient sits upright, with the tongue protruding from the mouth; the pulse is frequent and small; the aspect is livid, and death occurs from apnœa. In some rare instances the abscess has burst and deluged the trachea and bronchi causing death by suffocation.

In the case of a child three years of age, recorded by Dr C. Elliot, of the Bristol Children's Hospital, slowly increasing dysphagia was the leading feature, followed by convulsions and death. Nothing could be detected on examination but some redness of the fauces, and slight enlargement of the tonsils. There was no dyspnœa. Beef tea and brandy were introduced into the stomach through a gum elastic catheter. After death "an abscess containing about two ounces of pus was found situated in the upper and posterior wall of the pharynx." There was no disease of the bone, and the larynx and tonsils were healthy.†

Diagnosis.—The disease may be mistaken for croup, but the peculiar cough of the latter should distinguish it, and the insidious manner in which retro-pharyngeal abscess creeps on; it is much slower in its development, and the respiration is not involved till a late period. The complaint is quicker in its progress when it follows the exanthemata than when it arises from disease of the spine.

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* 'Brit. Med. Journal,' 1874, vol. ii, p. 371.

† 'Brit. Med. Journal,' 1879, vol. i, p. 663.

Treatment.—When the abscess is detected it should be opened with a bistoury, in the median line, without delay, and the finger will sometimes detect fluctuation when an inspection of the fauces fails to discover anything wrong. For a day or two after the puncture, the tumour should be occasionally pressed with the finger to squeeze out any accumulation of matter, and if the case goes on well, recovery will take place in two or three weeks. If the abscess is detected early and opened, the majority of the cases will recover; but if due to disease of the spinal column they are generally fatal. After puncture, cod-liver oil, the syrup of iodide of iron, quinine, nourishing diet, and pure air, will complete the cure.

Cynanche parotidea—Parotitis or mumps—is a contagious and common disease in children, often occurring as an epidemic in schools, or other places where a large number of young persons are living under the same roof. Sporadic cases are occasionally met with, and boys are far more frequently attacked than girls. The disease consists in inflammation of one or both parotid glands, sometimes, however, attacking one side of the side of the face only and terminating in resolution; the testicles of boys, and the breasts and ovaries of girls, occasionally sympathise in the swelling, especially when the affection begins to decline. Ordinary mumps is usually excited by exposure to cold, and runs its course in four or five days. When one member of a family suffers the others also become affected, though some authorities (with whom I cannot agree) assert that the complaint is not infectious. When the blood is contaminated by typhus, and some other fevers, inflammation of the parotid may terminate in suppuration.

According to Virchow the disease commences in the gland ducts rather than in the interstitial tissue of the parotid. When it arises from simple catarrh, the tendency to suppuration is much less, than when it originates in catarrhal inflammation of the gland ducts.

The *symptoms* are febrile disturbance and headache; there is stiffness and pain in opening the jaws, and swelling takes place between the cheek and the ear, extending down the neck, along the ramus of the jaw to the submaxillary gland. The face is sometimes flushed, and the child is very restless, and even wanders at night.

Treatment.—If there is much swelling two or three leeches may be necessary, and a poultice applied afterwards, but warm fomentations and a piece of flannel carried under the chin, usually suffice to bring about a cure. A saline and cooling aperient is desirable to relieve the feverish symptoms and open the bowels. The diet should be exclusively fluid, consisting of milk, thin arrowroot, tea, &c. If the gland remains enlarged after the acute symptoms have subsided, it leads to no bad consequences, and disappears in the course of time.

CHAPTER XII

INDIGESTION

STATE OF THE DIGESTIVE ORGANS IN INFANCY AND CHILDHOOD—*Influence of dentition on the digestive process—Chymification—Chylification—Absorption—Defæcation—Sympathetic disturbance in other organs—Digestion of different principles of food, starch, sugar, and fat—Sugar will not replace fat—Nitrogenous elements of food—Influence of weaning on digestion—Emotional indigestion—Solid meat not required till molar teeth appear*—SYMPTOMS *of the different varieties of indigestion—Vomiting—Pain—Intestinal irritation—Eczematous eruptions—Anorexia—Vitiated appetite—Bulimia—Pyrosis*—CAUSES—*Atrophy—General debility or inherited weakness—Improper or deficient feeding—Excess of animal food*—TREATMENT—*Alkalies—Calumba—Bark—Mineral acids—Nux vomica—Citrate of iron and quinine.*

THE functions of the digestive system in infancy differ in a remarkable degree from those of adult life when the organs concerned have reached a higher state of development. The calls for nourishment to meet the changes that are perpetually going on in the child are frequent, and too much care and importance cannot be devoted to this early period, when the stomach is so constantly occupied in preparing the food that is introduced into it for absorption and nutrition.

Indigestion is most common in infancy, and decreases with growth and the completion of the first dentition, when the stomach in healthy children becomes capable of bearing a mixed diet. The digestive organs in early life will only assimilate the simplest diet, and any deviation from it will be followed by discomfort, and symptoms which make up the sum total of indigestion.

In the pre-dental period of infancy the food reaches the stomach almost as soon as it is introduced in the mouth without mastication. When once it is in contact with the gastric mucous membrane, a secretion is poured out; the two combining form a substance called chyme, and the process is termed *chymification*. The next step consists in the action of the muscular coat of the stomach walls, forcing the fluid mass through the pyloric orifice into the duodenum, where mixing and becoming incorporated with the biliary and pancreatic secretions it is transformed into a cream-like substance termed *chyle*, and this process is called *chylification*. The villi which are scattered over the surface of the small intestine absorb the nutritive elements, and convey them into the lacteals, and so into the circulation through the receptaculum chyli. Those portions of the food which are useless, or resist absorption, are conveyed along the remaining tract of intestine and finally thrown out of the body as excrementitious matter, and this process is termed *defæcation*. In a state of health these processes are carried on without our consciousness, and a sense of comfort and satisfaction only is felt. Where digestion is imperfectly performed, either from defective health, or from the quality of the food that has been taken, indigestion results, and then symptoms of oppression, pain, weight, and distension ensue. The food is either rejected by vomiting, delayed in the stomach, or passed on into the bowels, causing diarrhœa, or some other form of irritation in these viscera.

We have here to consider what happens in infants and very young children in these cases. There is deranged action in the stomach itself, an alteration in the character of the secretion, and irregular or unhealthy muscular action. But indigestion once established involves by sympathy other and distant organs, and there is not an important viscus in the whole body that does not share in the general derangement, so much so, that it frequently distracts our attention from the stomach, and deludes us into looking at the sympathetic disturbance as the primary evil.

In children, as in adults, the stomach may have lost its vigour and tone, and therefore be incompetent to fulfil its functions; but in the vast number of instances, indigestion originates from the quality and quantity of food that is introduced into it. The mucous membrane is readily irritated, and resists the offence, just as any other organ of the body becomes irritated by some abnormal stimulation, and finally fails under the excitement.

As in early life the stomach is delicate, and susceptible to disturbance, we should be most careful to select a proper diet, to consider the quality of food that is supplied, to measure the capabilities of the digestive system, and to deal with them accordingly.

There are two sets of teeth, the *deciduous* and the *permanent*. In infancy there is a period of several months before any teeth are developed, and therefore the function of *mastication* is not required. In the early months of life there is no secretion of saliva. The mother provides her child with milk till growth and development fit it for an independent existence. By the time when the mother should wean her child at seven or eight months, the teeth begin to appear, and by the end of the first year, in healthy children, there are usually as many as twelve. There is no longer need for a fluid diet exclusively, but among the lower classes, prolonged lactation to diminish the risk of repeated pregnancies, is carried far beyond the limits of health in the mother or her offspring. Children of fifteen or sixteen months old may often be seen clinging to the breast for their only sustenance in the out-patient department of our hospitals.

When the child is once permitted to sustain itself another difficulty is presented. In many instances it is either provided with food which is improper, or it devours it too hastily, and so the troubles of indigestion are established. Food imperfectly masticated resists the solvent action of the gastric juice, and irritation arises in the digestive organs.

Regarding the process of *insalivation*, the secretions of the parotid and submaxillary glands are poured into the mouth, as well as that of the lingual and other smaller glands. Parotid saliva, in man at least, is watery, and acts as a solvent; submaxillary saliva is more viscid, and contains more of the active principle, ptyaline, which converts starch into glucose or grape-sugar.

Digestion of starch.—Starch is a non-nitrogenous principle, entering largely into the composition of some foods. Whilst it remains in this condition it resists absorption till the digestive system exerts its influence upon it. The first conversion is into dextrine, which much resembles starch, and then into sugar, which is easily absorbed. The action of the saliva converts starch into sugar when the process of mastication is properly carried on. As the food passes out of the stomach, the secretion of the pancreas and the glands lining the mucous membrane of the intestines exert their action upon the remaining starch, and further transformation into sugar takes place, and the blood-vessels convey the latter into the circulation, whilst the unchanged starch granules mix with the evacuations and are carried out of the system. Starch is not naturally a part of the food of very young infants when the digestive functions are imperfectly developed. Sugar is the form that suits them.*

Digestion of sugar.—This is principally the cane sugar which exists as a juice in many plants. It is so readily soluble that the digestive functions are in no degree taxed when it enters the stomach, by which it is readily absorbed into the circulation, undergoing a change into grape-sugar.

In some forms of dyspepsia, and especially in that of children, lactic, butyric, and other acids may be present as secondary products, arising either by their respective fermentations from articles of food, or from decomposition of their alkaline or other salts; and the tendency is immensely increased by saccharine articles of diet.

The envelopes of the fat cells are dissolved by the gastric juice, and their contents set free. These run into droplets, and are passed on into the small intestines, where they are acted upon by the bile, and the pancreatic secretion. By the agency of these the greater part of the fat is emulsified, and therefore rendered capable of absorption; partly split up into fatty acids and glycerine, and partly saponified. The absorption of fat appears to be of a physical rather than of a chemical nature.

State of digestion at the time of weaning.—In even healthy children this seldom takes place without causing some disturbance in the constitution, and the symptoms that arise are generally those that indicate disorder in the functions of digestion. The change of food when the mother ceases to suckle her child is fraught with risk for some time; the child is fretful and sleepless, has flatulence, diarrhœa, or vomiting, and forthwith it declines, looks pinched and careworn, has a weak cry, and the skin shrivels from the absorption of the subcutaneous fat, redness about the arms and thighs is observed, and the changed aspect is remarkable. Not that this condition ensues in all cases, for many healthy infants bear the change without manifesting either local or constitutional disturbance.

Indigestion is constantly associated with wasting in children. When they are so suffering, the food that is swallowed is at once rejected; they lose colour and strength, the muscles waste, and the limbs become attenuated. The child refuses the breast or takes it greedily; then begins to whine and cry, and can obtain no ease till the milk is rejected, because the digestive powers are unable to assimilate it. In addition to these symptoms others arise as heat about the mouth, with pain and acid eructations. In the gastro-hepatic disturbance of young children, the breath has often a sweet smell.* The motions are often slimy, offensive, and of a dark greenish hue, or they are pebbly, and there is constipation. When the child is fed on milk, or has a wet-nurse, the motions may be pale, and almost like the milk that is swallowed, which passes through the bowels unchanged; or the motions are variable in character (diarrhœa alternating with constipation), being loose and thin at one time and sticky and clay-coloured at another, with green spots like bits of spinach among them.

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* See Chap. II, where this subject is more fully considered.

Vomiting, so frequently present in these cases, is a reflex action, and is a common symptom of indigestion, or irritability of the stomach in infancy and childhood. It is also symptomatic of disease of the brain, of the lungs, of the various exanthemata, and diarrhœa depending on poisoned blood. It is a symptom that invariably excites alarm when it arises without any discoverable cause, and cannot be attributed to overfeeding or mechanical irritation. It usually happens that the milk does not agree either from fatigue, indiscretion in diet, or bad health in the nurse; what is swallowed soon causes flatulence and pain till it is finally rejected as a curd from the stomach, and the child at once seizes the breast again till the same symptoms recur, or after some discomfort it passes through the stomach and creates intestinal irritation and diarrhœa. The same is likely to ensue when the milk is healthy, but the child has been allowed to go too long without food, or is fatigued from heat or over-excitement. If, from any of these circumstances, vomiting ensues, it is important to allow the stomach rest, and whilst its tone is lost, to give a teaspoonful of cold water, or barley-water, till the sickness has passed off. When the symptoms do not yield to these measures, and the child is otherwise in good health, a mild mercurial, and milk-and-lime-water given in a teaspoon will generally afford relief. It may at the same time be advisable to prescribe small doses of hydrocyanic acid in a solution of magnesia, and to apply a mustard poultice to the epigastrium.

During the continuance of this state of things the child is weakly, and an erythematous rash may appear on the buttocks, or eczema on the face and scalp. I have seen this appear and disappear according to the severity of the indigestion, and in one case it was so bad, that the eyelids became œdematous from the swelling, and the features distorted.

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* 'Diseases of the Stomach,' by S. O. Habershon, M.D., 1879, p. 81.

Anorexia is a common symptom in dyspepsia, and when it is present, children will struggle to the utmost rather than swallow one particle of food. *Vitiated* appetite is sometimes seen in children. In one case under my care, a girl suffering from anasarca and albuminuria, devoured the most loathsome things possible, and required careful watching to prevent her from so doing.

Bulimia is seen among children suffering from worms in the intestinal canal, or mesenteric disease, it is also very common in cases of chronic hydrocephalus, and is by no means rare during convalescence from measles and some other acute diseases.*

Then there is a form of dyspepsia not uncommon, especially in boys.† The tongue loses its epithelium and is superficially ulcerated. Children thus affected bolt their food and have ravenous appetites. They lose flesh and do not thrive; they are pallid and delicate looking, and if the condition is allowed to go on it may pass into mesenteric disease.

In some cases, dyspepsia and intestinal irritation are brought on by giving young children too much animal food, which they swallow without sufficiently masticating it. After a time, in addition to epigastric pain, tenesmus ensues, the child wishing to go to the closet frequently; the motions are lumpy, thick, and brown, with jelly-like clots of blood on them, and there are faintness and nausea before the bowels act. This form of indigestion may, if the symptoms are not attended to, pass into dysenteric diarrhœa and the child may die of mesenteric disease and phthisis.

Pyrosis is sometimes seen in children of eight or nine years of age, and demands the same line of treatment as in the adult.

The *causes* of indigestion in infants arise in nineteen cases out of twenty from defective power on the part of the stomach to assimilate and digest the food that is supplied, or to the food not being always of the most digestible quality.

The alimentary canal is extremely sensitive in early life, and a mother learns from experience that if she is careless in keeping her own digestion in proper order she is sure to derange that of her offspring. After the seventh or eighth month, when the teeth begin to appear, the child will need some solid article of food, and it is then that biscuits and some farinaceous articles of diet may be given with the milk, later on a little beef tea or gravy, but not meat, till the second year. The irritation caused by the coming molar teeth induces the child to make masticatory efforts, and this excites the action of the salivary glands.

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* See Chap. VIII.

† See Chap. II.

The other *causes* of indigestion are an impure atmosphere and confined rooms, especially if several children occupy the same apartment. Hot sultry weather will frequently induce the complaint, and children reared in towns and cities are more frequent sufferers than those brought up in the country. Artificial feeding is probably the most frequent cause, especially that by the bottle, from the liability of the contents to turn sour and disorder the digestion. All children so suffering should be fed with a teaspoon.

Older children experience indigestion from eating unwholesome food, as sweets and raisins, cherries, &c., which, undergoing only partial change, cause pain and intestinal irritation. They are often feverish and drowsy, have headache, and are disinclined to move; they bring up what is swallowed, and complain of pain over the epigastrium. Their nights are restless, and the nervous system is so upset that a convulsion may follow. The neglect or continuance of the disease may lead to aphthous ulceration of the mouth, diarrhœa, or eclampsia.

Treatment.—In addition to the hints and suggestions already thrown out in this chapter, concerning food and judicious feeding, there are other matters to be recollected. Three conditions appear to be necessary to ward off indigestion in an infant, and when they exist, it is remarkable how slight is the stomach derangement. These conditions are:—1. The child to be healthy born. 2. The mother to be healthy, if she supports her own child. 3. The cow's milk used to be pure, from the same cow, and to be properly diluted.

The cause in operation requires to be diligently sought for, and a careful inquiry should be made into the circumstances of each individual case in order to remove it. It sometimes happens that an emetic will get rid of the offending material at once.

Care in nursing and proper feeding will often cure the disorder. The fixed alkalies of lime and magnesia may be added to the milk. If there is acidity, an occasional powder of soda and rhubarb is of service, and a grain or two of mercury and chalk may be added when the biliary secretion is deficient. It is a good plan to give alkalies when there are free acids generated in the stomach; a grain or two of bicarbonate of potash with sal volatile will prevent the coagulation of the milk and the formation of a curd. Dandelion and calumba may be added if the stomach has lost its tone and the liver is inactive.*

Alkalies ought not to be continued for too long a period, and the circumstance that curd is vomited by no means implies that there is acid in the stomach, because the gastric juice may be insufficient and the stomach weak. In that case the mineral acids are suitable to the youngest child, the hydrochloric or nitric acid, or both combined.† If there is sickness and debility, with scanty secretion from the liver, hydrocyanic acid in combination with nitric acid may be given.‡ Bark and nux vomica are also useful in some cases.§

Indigestion in children sometimes assumes an exeeedingly acute form. From being comparatively well a child becomes suddenly ill, restless, and feverish; its circulation and respiration are excited, and its temperature runs up to 103°, or even higher; the mother thinks the child has caught cold, or is commencing some feverish attack, but the suddenness and character of the seizure render this view unlikely. This suddenness is the great characteristic of acute indigestion, and at once points to the real cause, and relieves the anxiety. In such cases it is well to give an emetic of ipecacuanha, with a little antimonial powder and calomel. The child vomits, is at once somewhat better, and if its bowels are opened subsequently, the alarming symptoms disappear in a few hours. The quickness of the decline corresponds to the acuteness of the attack.

In chronic indigestion change of air is very serviceable, and one wet nurse may have to be changed after another; calumba, bark, and nitric acid are useful in these cases. In older children, the citrate of iron and quinine is a valuable remedy if there is anæmia.

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* Form. 19:
℞ Sodæ Bicarb. gr. xij
Spt. Amm. Arom. ♏xij
Syr. Rhei
Vel Succi Taraxaci ʒiij
Tinct. Calumbæ ʒj
Aquam Anethi ad ℥iss.
M. ʒij ter die.

† Form. 20:
℞ Acid. Nit. Dil. ♏xij
— Hydroch. Dil. ♏xxiv
Tinct. Calumbæ ʒj
Syr. Aurant. ʒij
Aquam ad ℥ij.
M. ʒj ter die.

‡ Form. 21:
℞ Acid. Hydrocyan. Dil. ♏xij
— Nitric. Dil. ♏xx
Syrupi — ʒij
Aquam ad ℥iss.
M. ʒj ter die.

§ Form. 22:
℞ Tinct. Cinch. Co. ʒiss
— Nucis Vom. ♏xij
Syrupi ʒij
Aquam ad ℥iss.
M. ʒj ter die.

For children a year old.

Dr Lauder Brunton advocates for children with defective digestion, stale bread cut very thin and the butter well rubbed into it, in preference to bread cut thick with a thick layer of butter, commonly seen in the nursery. In doing this the fat becomes finely subdivided, resembling the condition found in milk.

CHAPTER XIII

DIARRHŒA

VARIETIES—1. *Simple diarrhœa (catarrhal diarrhœa)*—2. *Bilious diarrhœa*—3. *Choleraic diarrhœa (Cholera infantum)*—4. *Congestive or inflammatory diarrhœa (Chronic muco-enteritis—mucous diarrhœa—entero-colitis)—Thermic diarrhœa*—5. *Lientery (Lienteric diarrhœa)*—6. *Dysenteric diarrhœa—Symptoms of the different forms—Green stools, their causes and significance—Clay-coloured pasty stools—Nervous diarrhœa—Chronic diarrhœa—The result of persistent simple diarrhœa, or the other varieties—Causes of diarrhœa—Dentition—Oversuckling—Impure air and water—Filth and overcrowding—Irritating food—Sour milk—Cold—Dyspepsia—Congestion of the liver—Artificial feeding—Sometimes a complication of rickets, whooping-cough, and measles—Treatment of simple diarrhœa—Castor oil—Dover's powder—Bismuth—Ipecacuanha—Astringents—Warmth—Rest—Stimulants in cases of exhaustion—Rhubarb—Treatment of the choleraic, and remaining acute forms of diarrhœa—Treatment of chronic diarrhœa—Raw meat juice—Extract of malt—Acetate of lead—Gallic acid—Logwood—Catechu—Krameria—Sulphuric acid—Syrup of red gum—Extract of Bael—Sulphate of copper and opium—Astringent enemata—Change of air—Prolapsus ani—Its causes and Treatment.*

DIARRHŒA is produced by many conditions, and among children is more often a salutary than a diseased process. It is of common occurrence when a septic poison is generated from the decomposition of vegetable matter, or the atmosphere is charged with miasmatic effluvia. After absorption through the lungs into the blood, the intestinal mucous membrane becomes irritated and excited, in virtue of an inherent disposition on the part of the economy to eliminate these noxious agents.*

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* See 'Lectures on the Infective Processes of Disease,' by J. Burdon Sanderson, M.D. LL.D., F.R.S., December, 1877.

We meet with it again, when water containing organic impurities, obtained from the vicinity of graveyards and stagnant pools, is used for drinking purposes. When contaminated with fœtid gases, fermentative dyspepsia arises, and the bowels show signs of a disorder, varying from simple irritation to choleraic purging, cramps, and loss of body heat.

As a healthy process, a sharp attack of diarrhœa proves its own cure, irritant and offensive matter being thus got rid of by the bowels, when the stomach cannot assimilate the food that is taken. We aid these efforts when nature fails to complete the cure by administering such remedies as remove any morbid materials from the system.

Diarrhœa is common enough in infants when too much milk is swallowed, or when rich or sour milk, instead of being thrown up by vomiting, passes on into the intestines, and creates irritation there. Exposure while dressing, insufficient clothing, the use of too cold water in washing, and the neglect of cleanliness, will all induce excessive peristaltic action of the bowels.

Statistics clearly prove that there are few diseases in infancy and early life of greater frequency or danger than diarrhœa; it will often set in from slight or unascertainable causes, and decide the fate of a young child in a few hours. The delicacy of the stomach and intestines in infancy renders this one of the commonest ailments. If the supply of food is not of the simplest kind, and given in small quantities to suit the tender age of the child, digestion and absorption will be deranged, and the local disturbance thus initiated will convey the irritation to some other organ, and expose the life of the child to considerable peril.

Diarrhœa in children may be conveniently grouped into the forms enumerated at the commencement of this chapter. This is, however, at best, but an arbitrary division, for simple diarrhœa may pass into any of the other varieties, if the irritation lasts long enough to excite sufficient disturbance in the mucous membrane; and it is often impossible to separate them in practice.

1. *Simple diarrhœa* (Catarrhal diarrhœa).—In this variety there is an excess of natural action, the evacuations are copious, relaxed, and frequent, and the child, if an infant, is soon exhausted in consequence. The attack may at first be painless, and as there is a loss of consistence in the motions they are squirted out with spasmodic effort. The evacuations are fæcal, and if at first greenish, they become yellow as the symptoms subside and improvement sets

in. And here I may observe that the fæces during the first year of life are of pappy consistence, and yellowish in colour like the yolk of egg; the smell is slightly acrid, but never putrid, whilst the diet consists of milk and farinaceous food, but when meat is substituted it becomes offensive as in the adult.

The early symptoms of *simple diarrhœa* are hardly noticeable if the discharges are moderate, but there soon follow general discomfort and peevishness, the child is disturbed in its sleep, and, perhaps, becomes languid and paler than usual. The tongue may be slightly coated, and there is usually some thirst and diminished appetite. When the attack is acute there is sickness, thirst, and dryness of the mouth; the strength is reduced, and in a few hours the child may be much weakened. The little patient becomes sunken about the eyes, the features are sharpened and even collapsed, and the fontanelles are depressed; there is sometimes febrile disturbance with cough and bronchial irritation; the abdomen may be swollen and tender from flatulence, or concave and empty. If the diarrhœa goes on actively for a day or two, flesh and strength are rapidly lost, the muscles feel soft and flabby, the pulse becomes quick and feeble, and life is placed in imminent danger. The change in the character of the evacuations consists in their being thinner and more copious, though they seldom lose their feculent appearance, except in very severe cases, or where the disease is obstinate. In these cases the motions soon become offensive after escape from the body, and may be even greenish and slimy.

When the diarrhœa is sharp and continuous it sometimes induces so much relaxation of the sphincter as to cause prolapsus ani.

The *anatomical* changes in the lining membrane of the intestinal tract consist in congestion of the vessels, which disappears after death. There would seem to be no pathological changes in the simple form of the complaint, even if it proceed to a fatal termination.

2. *Bilious diarrhœa* may be witnessed in some children who eat inordinately of animal food, and live too well for the wants of the system. Impure milk, like impure water, is capable of giving rise to this form of diarrhœa, and in severe cases the symptoms may become dysenteric. A large quantity of bile is secreted by the liver and poured out into the intestines, which it irritates. The disease is most common in hot weather, and of course far more frequent in tropical climates, when the liver is apt to be congested from diminished respiratory action. It arises from an excessive

secretion of bile which stimulates the bowels to frequent action, the motions being copious, loose, and of a dark yellow or green colour; the urine is scanty and high coloured, and may contain traces of bile also. The secretion of bile may be enough to provoke fever, unless it finds its way freely out of the system.

3. *Choleraic diarrhœa* (Cholera Infantum—gastro-intestinal catarrh—Rilliet and Barthez) is most common in infants, and in those who are early weaned or badly fed. The disease usually follows a rapid and fatal course. Its frequency is much greater in cities than in country districts, and in summer and autumn than at other seasons of the year. Some authorities consider it frequent during the period of the first dentition. It is in my experience far more frequently due to atmospheric influences and errors of diet. It usually commences with simple or inflammatory diarrhœa, the child loses its appetite or is fretful, then it is seized with purging, and occasionally with vomiting, attended with prostration, pallor, and symptoms of sinking. Violent retching sometimes co-exists with choleraic diarrhœa, and the disease may set in very suddenly, and rapidly proceed to a fatal termination. The tongue is slightly coated or clean, smooth, and dry, and the pulse quick and small. As the disease progresses the respiration becomes oppressed, the urinary secretion is suspended, and the surface of the body is cold, damp, and sometimes livid. The discharges at first are thin and fæcal, or frothy, with mucus or altered bile, but in the course of a few hours there are no traces of a biliary secretion whatever, the evacuations being copious, frequent, and like rice water or oatmeal gruel, from containing shreds of intestinal epithelium. It is the excessive discharges of colourless fluid which distinguish this form of diarrhœa from any other. So great is the quantity that one evacuation will saturate the napkins of the child, and completely soak through the bed linen, as though they had been kept under water for hours. When the stools are pale and fluid there is no odour belonging to them; but if they are in any degree feculent, and yellowish or greenish, then they are extremely fœtid and offensive, and, notwithstanding the utmost cleanliness, the odour is at once perceptible on entering the sick apartment.

At first there are evidences of pain and griping sensations in the stomach and bowels; the hands and extremities are cold, the face is pinched, and the eyes are hollow. There is craving thirst, and fluids are no sooner swallowed than they are brought up again—all appetite is gone, and sleep is broken and unrefreshing. If the disease does not soon yield to remedies, the child passes into a state of coma and dies. If the disorder lapses into a chronic form the evacuations may assume a dark greenish and putrid character; the belly becomes tumid or tympanitic, and the tongue is covered with aphthæ. The disease may end fatally in a few hours or extend over some weeks. Cases apparently hopeless sometimes recover.

The liver has been observed to be enlarged in this affection, but the most constant anatomical change would appear to be enlargement or softening of Peyer's patches, with an erythematous or inflammatory condition of the lining mucous membrane.

The following is an example illustrating these several points. A female infant, ten months old, was seen by me on July 10th, 1868, at 8 a.m., having slept only two hours during the night, and not at all the day before. It had been taken out in the air, and the want of sleep was attributed to being left in the sun. The bowels acted three times before 3 o'clock on the preceding day, and again at 3 a.m. next morning—the last motion was very watery, but fæcal. At the time of my visit, the child was cold, pinched, and collapsed, eyes languid and set, lips very blue. The child was at once placed in a warm bath, and twenty drops of brandy given in some arrowroot, which she greedily sucked. The circulation almost at once returned in the skin and lips, and she was then taken out and put into a blanket; but gradually the arterial hue deserted the lips, the surface of the body was pale and contracted, and she became livid as before. She was again placed in the bath, and precisely similar symptoms resulted, the colour returning, and the child assuming a brighter aspect. When removed from the bath she as quickly as before became blue and collapsed, but to a somewhat less extent. A mixture of aromatic spirit of ammonia and spirit of chloroform was given, and a mustard poultice applied along the spine. At 11 a.m. the child had rallied, and there had been a colourless watery motion without a tinge of bile. The medicine and beef tea were given alternately every hour. At 1 p.m. dilute sulphuric acid with spirit of chloroform was prescribed every second hour, and at 5 p.m. the child had rallied, though there had been three similar rice-coloured watery motions, after which more decided collapse set in, and the child expired with a slight convulsive seizure at 7.45 p.m. No post mortem was allowed.

4. *Congestive inflammatory or mucous diarrhœa—Entero-*

colitis—Muco-enteritis.—In this variety there is a considerable degree of inflammatory action, quickness of pulse, and constitutional disturbance. The evacuations contain a large quantity of thin mucus, which afterwards becomes thicker and approaches the colour of pus. The motions are neither frequent nor excessive; they are usually variable in colour, sometimes being greenish and offensive like chopped spinach, and at other times yellow and mixed with mucus. Straining in going to stool is a common and distressing symptom, and more or less blood is intimately mixed with the mucus or fæcal matter.

Among the *causes* of this form of diarrhœa may be enumerated damp and cold, and transitions of weather, but errors in diet would appear to be a fertile source of its origin. If the nurse's milk is too rich, or in any way unhealthy, it is very likely to set up diarrhœa in any form. It may be a sequel to choleraic diarrhœa, the bowels remaining irritable, and producing chronic inflammatory changes in the mucous membrane, which lead to gradual death by exhaustion. I agree with Meigs and Pepper, who consider that whether diarrhœa is caused by improper food, summer heat, dentition, or epidemic influences, the complaint, if it becomes chronic, is apt to terminate in this disease.* It is not unfrequently met with in children in the out-door department of our hospitals, and I have long been of the opinion that the complaint is traceable in them to exposure to heat or cold. The cases we ordinarily meet with during the summer are of this character, and hence its frequency among the children of the poor, who are at the same time badly fed, and reared in an unhealthy atmosphere.

The cutting of the teeth may exert an influence in causing diarrhœa, as it does in setting up irritation in the brain and other organs. It is common between the ages of six months and two years, when the first dentition is completed.

The disease may be acute or chronic. In the *acute* form the symptoms are active from the first, inflammatory products passing off from the intestines, and the disease seldom lasting more than a week or ten days. The *chronic* form of the disorder may continue for weeks or months; there is gradual loss of flesh and strength, and the bowels are continually acting.

The morbid appearances are a thickening or inflammation of the intestinal mucous membrane, which becomes red or of a darkish grey hue, with the evidence of ulceration or enlargement of the glandular follicles lining the colon and small intestine.

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* 'Diseases of Children,' 5th edition, 1874, p. 384.

Muco-enteritis may follow an attack of measles, pneumonia, whooping-cough, or typhoid fever. It is prone to attack feeble and delicate children of strumous constitution. The abuse of aperient medicines may induce a simple diarrhœa which passes into this form, and weaning, or the change of a nurse is another cause. The morbid anatomy of the affection shows disease of both the large and small intestines. In the large intestine, the sigmoid flexure and descending colon are chiefly affected; in the small intestines, the lower part of the ileum. In the acute stage, the mucous membrane of the intestine is increased in vascularity and softened.

Thermic diarrhœa is the form met with in summer and especially in hot climates. It has been well described by Dr C. G. Comegys and Dr H. C. Wood. It may be designated "thermic or heat diarrhœa." "Any one who has seen," says Dr Wood, "as I have this summer, the child on whom drugs had ceased to act, and who was seemingly doomed to die, relieved in twelve hours by enforced cold bathing, every three or four hours, will grant to Dr Comegys the credit of having introduced one of the most life-saving improvements in modern infantile therapeutics. The sudden sweet sleep, replacing, after the bath, the fretful nights and days of unrest, is a thing never to be forgotten when once seen, and the arrest of diarrhœa is certainly no less remarkable."*

"We are summoned, in short, very often to see a child with a hot skin (temperature 102½°—105°), rapid pulse (130—150) and breathing (30—40), with frequent purging of semi-fluid, greenish, watery, fæcal, and half digested matters; the mouth and tongue are dry, the thirst is intense, but the water given to appease it is quickly thrown off, the eyes are staring, pupils contracted, insomnia, rolling the head, and uttering distressing cries, due to the headache from hyperæmia of the cerebral vessels and the unappeased thirst." The bath is first at the summer temperature of 75°, the feet and legs are first gradually immersed, and then water is poured over the chest and abdomen till the whole body is under water. Colder water (65°) is then poured in a continuous stream over the upper part of the head, and this is kept up for fifteen minutes. When the child is removed from the bath it is wrapped in a woollen shawl, and placed in bed with additional covering. It falls asleep, the skin is cool, the pulse and respiration fall in frequency, and the temperature is at or below the normal standard. If the symptoms return the bath may be resumed three or four times a day. The internal treatment consists in giving beef tea, milk, and lime water, "one grain of quinine and half to a teaspoonful of whisky every three hours for a child eight to sixteen months look formidable, but they will be borne admirably." With the departure of the fever, bismuth and pepsine are given to restrain diarrhœa and assist digestion.*

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* "Sunstroke, or Thermic Fever," by Dr H. C. Wood, 'Philadelphia Medical Times,' August 5th, 1876, p. 542.

5. *Lienteric diarrhœa.*—This form of diarrhœa, known as *lientery*, is characterised by the passage of undigested food through the bowels; it is very commonly seen in artificially reared children, especially among those who are subject to mesenteric disease. Meat, bad milk, and vegetables, on which the gastric juice has no action, pass through the stomach, setting up irritation in the bowels. The food undergoes scarcely any change in its passage through the long and tortuous length of the alimentary canal. Shortly after eating, the child experiences discomfort, and passes the meat, which has just been previously taken, without the secretion of the stomach having exerted a solvent action upon it. It is probable that the stomach is feeble and primarily at fault in so rapidly dislodging its contents. The child's appetite is greedy and never satisfied: there is great debility and loss of flesh, because the food is not absorbed, and there is thirst and general irritability.

Dysenteric diarrhœa.—When the discharge of mucus from the bowels is excessive, and is attended with a considerable quantity of blood also, and there is no fever, we may recognise this form. It is not exactly one of acute or chronic dysentery, but of great congestion of the intestinal vessels, leading to their rupture. There are feculent discharges, with tenesmus, pain in the body, and wasting, and the child loses flesh rapidly. Dysentery may be described as a severe form of muco-enteritis, with more pain than is felt in diarrhœa.

Nervous diarrhœa.—Dr Lees has described a form of diarrhœa which he considers of neurotic origin, and independent of diet. The children so affected are nervous, timid, and easily frightened.

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* "Cold Bathing in the Treatment of Inflammatory Bowel-affections during the Summer," by C. G. Comegys, M.D., 'Philadelphia Medical Times,' July 17th, 1875, p. 665.

This diarrhœa is supposed to arise from dental irritation, and is most common during the second dentition. The chief symptom is an irresistible inclination to defæcation. Colic pain may or may not be present: there is no heartburn, flatulence, or other symptom of dyspepsia. The motions, which are usually passed after every meal, are semi-solid and sometimes contain undigested food. The increased peristalsis is due to irritation of the par vagum which supplies excitor fibres to the intestines. The treatment consists in giving bromide of potassium, without opium, or any other astringent.*

Chronic diarrhœa.—This form may be, and often is, the consequence of the acute forms passing into it by slow degrees, or it may follow cold and over-feeding, the use of sour milk, or the milk of a wet nurse which is in all respects apparently healthy. The continued discharges from the bowels gradually reduce the strength and impair the powers of nutrition. A chronic state of irritation or catarrh is induced, and the longer it lasts the more difficult will it be to control. In this form of the disease the motions are variable, sometimes being copious and at other times quite thin and slimy, with gelatinous masses of mucus streaked with blood. As we have seen in the disease known as "*lientery*," any undigested food in the motions is significant of feeble digestive power and impaired nutrition; the milk or other articles of diet pass through the stomach rapidly, and in many cases there is a deficiency of bile.

Causes of diarrhœa.—In most cases diarrhœa is the consequence of improper feeding. A very common cause is the habit of giving young children farinaceous or biscuit food, instead of milk, especially if the child is delicate or rickety. The stomach is easily deranged, and the unhealthy products of digestion entering the intestinal canal excite irritation till they are eliminated. So far, it is a salutary process, and the diarrhœa may soon pass off. Since the use of feeding bottles has become general, diarrhœa is easily provoked if they are not properly cleansed and rinsed out. When this precaution is neglected, any fresh milk that may be put into them turns sour and acid. Diarrhœa may be induced by unhealthy nurses whose milk is deranged through privation or anxiety, or when they are suffering from leucorrhœa. Impure water, bad air, filth and overcrowding, are also to be enumerated among the chief causes of the complaint. Exposure to cold or heat, and biliary derangement may all lead to the disorder. Very troublesome diarrhœa may sometimes be witnessd in children at the time of weaning. The child has probably become badly nourished from the mother suckling it till it is a year old, and then the change of diet to corn-flour, mashed potatoes, bread and butter, and even a little meat, will cause relaxation of the bowels, restlessness and thirst; five or six motions will escape during the day, slimy and containing spots of blood. Only a change of diet can set matters right.

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* "Note on a Form of Diarrhœa in Children," 'The Lancet,' vol. i, 1884, p. 857.

Diarrhœa is sometimes noticed in connection with rickets, and it very frequently follows whooping-cough and measles.

Troublesome diarrhœa may be kept up by the indiscriminate use of aperient medicines.

Treatment.—This will depend upon the cause, which should be if possible ascertained. But whatever may be the origin, and whatever the variety or stage of the disorder, the diet will require immediate and careful attention. The age and constitution of the child are to be considered, and it should be particularly noticed whether it has become suddenly, or gradually ill; this question is of immense importance in the plan of treatment to be pursued. If the child has no teeth, corn-flour, and farinaceous food of all kinds must be forbidden, and milk in some shape be relied upon. If the child is an infant, and artificially reared, a tablespoonful or two of lime water should be mixedwith each bottle of milk, and this will aid the digestion of it and prevent it turning sour. If there is much sickness, it may be necessary to apply a small mustard poultice to the pit of the stomach, to suspend the milk for a time, and to give barley-water in its place, and a teaspoonful of cold water occasionally. Too much stress cannot be laid on the importance of feeding, and of selecting the purest milk. When every precaution has been taken with the bottle, in the way of cleanliness, I have known the diarrhœa continue or the bowels to remain quiet one day and the discharges to be healthy, and yet griping pain, exhausting diarrhœa, and sickness to follow next day. The bottle is abandoned in consequence, and the child is fed with diluted cow's milk in a teaspoon, and forthwith the diarrhœa ceases. In some cases Swiss milk has occasionally succeeded better than cow's milk, and that when one wet nurse after another has failed.*

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* See Chap. II.

The *simple* form of diarrhœa is consequent upon irritation of the lining membrane of the bowels in the majority of cases, and therefore it is not prudent to hastily check it, as it is an effort on the part of nature to expel offending matters from the system; if after a time the diarrhœa continues, a morbid action of the mucous membrane is kept up, which demands remedies to control it. If it appears to arise from irritation in the stomach or bowels, a teaspoonful of castor oil, or a few grains of soda and rhubarb, will soon arrest the symptoms and the child will feel no further trouble. In that variety of diarrhœa where there is straining with mucus, or mucus with blood, a paste of castor oil[*] and magnesia, with a carminative will be very useful. If there is griping pain, and the diarrhœa is profuse, the addition of half a minim of laudanum will be serviceable.[†] Castor oil possesses mild and unirritating qualities, and promotes the escape of fluid secretions from the intestinal canal without pain or discomfort. This being accomplished, its subsequent action is said to be astringent, so that at the commencement, it is probably the safest and best eliminator of morbid secretions which excite irritation of the bowels.

When the diarrhœa is acute and recent, soothing and unirritating diet is especially to be recommended, rice-water flavoured with cinnamon, or barley-water, so that the intestines may have all possible rest. Sago, tapioca, corn-flour, arrowroot and chicken broth, are all articles of diet to be borne in mind. In older children, where the diarrhœa appears to depend on congestion of the mucous membrane, a combination of grey powder and Dover's powder will be useful for a few nights, with bismuth mixture during the day.[‡] I have seen excellent results from this plan of treatment in out-patient practice, even when the children have not been confined to the house. The treatment of summer diarrhœa has already been considered.

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[*] Form. 23:
℞ Ol. Ricini ℥ss
Magnes. Carb. ʒij
Sacchari ʒiij
Ol. Anisi ♏ij. M.
A teaspoonful for a dose.
(An infant may take a dose occasionally.)

[†] Form. 24:
℞ Ol. Ricini ℥ss
T. Opii ♏vj
Mucilag. ʒij
Syr. Zingib. ʒiij
Aquam Anethi ad ℥iss. M.
One teaspoonful to be given occasionally.

For children from six to twelve months old.

[‡] Form. 25:
℞ Sodæ Bicarb. gr. xij
Liq. Bismuth. ʒij
Mucilag. ʒij
Syr. Zingib. ℥ss
Liq. Magnes. Carb. ℥iv. M.
A dessert-spoonful three times a day.
For a child two years old.

The treatment of *diarrhœa*, particularly in *teething* children, is apt to be looked at with a one-sided view—the quickest way to stop the diarrhœa. This is a fatal mistake. If the child is of full habit with florid face, and greedy with its food, it is not a good plan to hastily check the diarrhœa, but we should simply moderate the alvine losses by some alkaline mixture; and if there are any teeth pressing against the gums, the latter should be scarified or well incised. Very often the general disturbance and intestinal disorder yield at once to these remedies. Speaking of the diarrhœa arising from improper food or teething, Dr Pavy writes, "I am in the habit of giving, and with the most satisfactory result, a little ipecacuanha with a bitter and a saline. My prescription consists of a few minims of the vinum ipecacuanhæ, twenty minims or so of the tincture of calumba, and one or two or three drachms of the Mistura Salina of the Guy's pharmacopœia, which is made by saturating a solution of carbonate of potash, containing twenty grains of the carbonate to each fluid ounce of water, with lemon juice. Conjoined with this, a couple of grains of grey powder are sometimes given as an alterative every morning; or sometimes a powder consisting of a quarter or half a grain of calomel, two grains of the dried carbonate of soda, and five grains of the aromatic powder of chalk."* The formula, recommended by Dr West, containing small doses of vinum ipecacuanhæ and liquor potassæ, is also very useful.†

As a rule, astringents are objectionable at an early stage of diarrhœa, which may continue in spite of them unless other precautions are taken. If the motions contain mucus and are slimy, and there is any escape of blood, or redness about the anus, chalk mixture, catechu, acids, or bismuth, will be of no service; but in their stead the remedies we have already pointed out, especially the castor oil paste and alkalies, with an alterative or sedative, as the case may appear to warrant.

The diet is primarily at fault in these cases, undigested food having passed into the bowels, and having excited over activity of their functions. Warmth and complete rest, with a dose of castor oil, is the most appropriate treatment, and a grain of

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* 'Digestion and its Disorders,' 1867, p. 199.

† Op. cit., p. 524.

Dover's powder with a grain of grey powder may be necessary. Now and then a quarter of a grain of calomel will be found of use in children who are old enough and strong enough to bear it.

Among hospital patients, a large number of cases of diarrhœa are traceable to oversuckling, and suckling by mothers in delicate health, or harassed by anxiety. The return of the catamenia or even menorrhagia is no hindrance to the habit. If such children are removed from the breast, and cow's milk is given diluted with water, previously warmed and sweetened, the diarrhœa will generally subside. When milk appears to keep up the diarrhœa barley-water, or cold water thickened with isinglass will be necessary, or thin water arrowroot. Sometimes a powder containing two or three grains of rhubarb and carbonate of soda will neutralize the acidity which has resulted from the fermentative products of digestion and soon arrest the disorder.*

In some cases where the child is strong, and the motions contain mucus or blood, a mixture of sulphate of magnesia, tincture of rhubarb and peppermint water may be prescribed with advantage.†

As to *stimulants*, if there is much exhaustion a few drops of brandy (and there is no better stimulant) in weak arrowroot or milk are advisable, and if there is much sickness, a mustard poultice to the epigastrium. A teaspoonful of cold or iced water will often allay the sickness. Wine whey (one part of wine to three of boiled milk) is useful where the child is exhausted, and life may sometimes be saved by it.

In the treatment of *bilious diarrhœa*, alkalies, especially soda salts, should be given to relieve acidity, with one or two minims of laudanum, if there is much pain. An occasional mild mercurial is also serviceable.

Treatment of cholera infantum.—In the whole catalogue of infantile disorders there is no disease requiring greater vigilance and care. Any error of judgment is speedily fatal. The child should be confined to a spacious airy room, and the utmost quietude observed. When the bowel discharges are profuse and watery, and the child's strength is good, a dose of castor oil or rhubarb may be advisable, because the choleraic poison, or other offending materials, will keep up the intestinal discharges, as long as they remain pent up in the system. Elimination through the bowels, consistent with the strength of the child, is therefore a rational mode of treatment.

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* Form. 26:
℞ Pulv. Rhei
Sodæ Bicarb. āā gr. xij
Spt. Amm. Arom. ♏xx
Syr. Zingib. ʒiij
Aquam Menth. Pip. ad ℥iss.
M. A teaspoonful every four hours.

† Form. 27:
℞ Magn. Sulph. ʒj
Tinct. Rhei ʒj
Vel Syr. Rhei ʒij
Tinct. Quiniæ ʒss
Aquam Menth. Pip. ad ℥iss.
M. A teaspoonful every four hours.

For children a year old.

After this, it is well to moderate the drain, if the child's strength fails, by krameria, or one or two drops of laudanum (Form. 15), and the treatment continued, or modified, according to circumstances. If looseness of the bowels goes on unchecked, it becomes a diseased and not a curative process.

When there is vomiting, prussic acid in combination with a drop or two of laudanum, or the solution of muriate of morphia may be given; but too frequently nothing arrests the sickness. It is in these cases that dilute sulphuric acid has been recommended (Form. 34). The fact of vomiting ought not to discourage a plentiful supply of cold water, in very small quantities at a time, or toast water to alleviate the thirst. If indeed the retching is distressing and urgent, a drink of tepid water, by facilitating the escape of morbid secretions from the stomach, is a rational plan to try. In this way the vomiting and purging may be arrested in many cases that appear almost hopeless.

As long as there are offensive matters in the bowels, it must be our endeavour to get rid of them, as their retention in the body increases the mischief, and therefore opium and its preparations should be given with great caution.

When the disease has passed into the stage of collapse, there is an impediment to the circulation through the lungs, and the remedies for exhaustion, as stimulants and opiates generally fail to afford relief. The body must be kept warm with flannel, or the warm bath, cramps relieved by friction, and a few minims of sal volatile or chloric ether administered. If it is considered advisable to employ a warm bath to encourage reaction, the temperature should not exceed 95° Fahr.; the child should not be suddenly immersed, but a blanket should be laid over it, and then the child being also well protected with flannel, can be gradually let down into the water without causing any alarm.

Dr George Johnson attributes the collapse in cholera to spasm of the arterioles of the pulmonary artery from an alteration in the blood, but this does not appear to me quite a satisfactory explanation of the phenomena, when we remember there are conditions allied to this form of collapse in which the blood cannot be said to have undergone a poisoned state, or the lungs to be specially implicated. On the other hand, some drugs in poisonous doses, and some animal and vegetable substances have exerted such an irritating action on the stomach and intestines as to produce symptoms resembling cholera collapse.* The calibre of the vessels may be influenced by the sympathetic nerve throughout the alimentary canal, and paralysis of the vaso-motor nerves would produce dilatation and relaxation of the vessels, the child being thus bled as it were into its own veins, and watery discharges are the consequence.

When reaction is established, a few drops of brandy, chicken broth, milk, and the mineral acids are serviceable.

Calomel is scarcely to be thought of in these cases, for fear of increasing the general depression. If it be ever advisable, its exhibition should be confined to the early stage when the motions are fæcal, and never had recourse to when the discharges are watery and serous for fear of increasing the gastro-intestinal irritation. Niemeyer seems, however, to have used it successfully, and Dr Lewis Smith has seen advantage follow a fractional part given night and morning with opium and astringents. When the case is seen early Dr Comegys recommmends the hypodermic injection of morphia, followed up with small doses of calomel and camphor in sugar of milk, until bile appears in the motions. This seems to me a very hazardous measure.

In the treatment of *dysenteric diarrhœa*, one or two grains of ipecacuanha may be given three times a day, and though sickness may at first be produced, tolerance is soon established.†

Treatment of chronic diarrhœa.—If the diarrhœa occurs in an infant, it should, if suckling, be limited to the breast, and no other food be given whatever, unless circumstances of a grave character should arise, and then it may be necessary to suspend nursing for a time, and give barley-water, thin veal broth, &c. Then too, the milk of one nurse will keep up diarrhœa, when that of another will be easily digested; and it will not unfrequently be found that one nurse after another will fail to supply suitable nourishment to the child, till we have to fall back upon plain milk and water. If this does not succeed, condensed milk should be tried, as I have previously mentioned. The microscope may detect nothing wrong in the milk of the nurse, and yet it may cause the most violent irritation. Where milk disagrees to such an extent as this, it is obvious that some other means must be adopted for a time to support the child. For children who have reached five or six months old, veal broth, or weak beef tea, or raw meat juice, may be tried, if the milk appears to keep up irritation. As the child grows older it will be able to digest better, and then the discretion of the practitioner must be used, and the diet varied according to circumstances. As long as the stools are unhealthy or pasty, all farinaceous food must be given with caution, as it will frequently pass through the stomach undigested.

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* "On some Analogies of Cholera," &c., 'Med.-Chir. Trans.,' 1868, vol. ii, p. 1, by W. Sedgwick, M.R.C.S.E.

† 'St Barth. Hosp. Repts.,' vol. xi, p. 273.

Too much importance cannot be attached to the food. It should be pure, nutritious, and unirritating. Where there is defective nutrition the child will gradually waste, and the more exhausted it becomes, the more difficult will it be to overcome the diarrhœa, which is prone to go on in spite of all the pharmaceutical remedies in vogue. Hence it is that *raw meat juice* sometimes answers so well in these cases. It may be made of beef or mutton.[*]

With regard to drugs, it should be remembered that there is a great tendency to acidity of the secretions. Excess of acid in the stomach retards the digestive power, excites fermentation, and causes flatulence, pain, and irritation, so that the child is never easy, and can obtain no rest.[†] Potash, by neutralising the acidity, arrests the fermentative process, and it may be given with dill, aniseed, or cinamon water, three or four times a day after feeding. If the stools are thin, a mixture of bismuth and potash, or soda may be given (Form. 25). As long as the motions are acrid and offensive one of these remedies should be prescribed. Sometimes a grain of Hyd. c. Creta may be most advantageously added to a powder of soda and rhubarb. Ipecacuanha, in doses of a quarter of a grain, with the castor oil mixture and laudanum (Form. 24), is an excellent remedy, particularly in the dysenteric variety. Creasote has been employed successfully when the motions are frothy and fœtid. A chronic diarrhœa is cured or kept in check by gallic acid, or acetate of lead, recommended by Dr West (Form. 28, 29).* Some of the following mixtures, containing logwood (Form. 30), catechu, and chalk (Form. 31), krameria (Form. 32), nitric acid

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[*] "Take one pound of fresh beef, free from fat, chop it up fine, and pour over it eight ounces of soft water, add five or six drops of hydrochloric acid and fifty or sixty grains of common salt, stir it well, and leave it for three hours in a cool place. Then pass the fluid through a hair sieve, pressing the meat slightly, and adding gradually towards the end of the straining about two more ounces of water. The liquid thus obtained is of a red colour, possessing the taste of soup. It should be taken cold, a teacupful at a time. If preferred warm, it must not be put on the fire, but heated in a covered vessel placed in hot water. Should it be undesirable for the patient to take the acid, this soup may be made by merely soaking the minced beef in distilled water."—*Handbook of Therapeutics*, by S. Ringer, M.D., 4th edit., p. 610.

"A piece of the lean of mutton should be minced, pounded to a pulp, and all fibrous threads carefully removed. To ensure its fine division and complete separation from indigestible fibre, it is useful to have it rubbed through a sieve. The pulp, duly mixed with bread crumbs and salt, may be given in a daily quantity of from one to three ounces, according to the age of the child. This is particularly called for when the motions contain a large proportion of unaltered food. Under this invaluable remedy, the state of the bowels and of the general health often improves at once and together. Occasionally, in chronic diarrhœa, I have seen benefit from the extract of malt."—*On Infantile Diarrhœa*, by W. H. Dickinson, M.D., 'Medical Times and Gazette,' Sept., 1872, p. 256.

[†] See Chap. XII, "On Indigestion."

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* Form. 28:
℞ Acid. Gallic. gr. viij
Tinct. Cinnam. ʒj
— Opii ♏iv
Syrupi ʒj
Aquæ Cinnamomi ʒv
Aquam ad ℥ij.
M. Two teaspoonfuls every four hours.

Form. 29:
℞ Plumbi Acetat. gr. vj
Aceti ♏xx
Tinct. Opii ♏viij
Mucilag. Acaciæ ʒij
Syr. Zingib. ʒj
Aquam ad ℥ij
M. Two teaspoonfuls every six hours.

Form. 30:
℞ Tinct. Opii ♏vj
— Card. Co. ʒj
Syrupi ʒij
Decoct. Hæmatoxyli ad ℥iss
M. A teaspoonful every four hours.

Form. 31:
℞ Tinct. Catechu ʒj
Syr. Zingib. ʒij
Mist. Cretæ ad ℥iss.
M. A teaspoonful every four hours.

Form. 32:
℞ Tinct. Krameriæ ʒij
— Opii ♏vj
Spt. Chloroform. ♏xx
Pulv. Acaciæ ʒss
Aquam ad ℥iss.
M. A teaspoonful every four hours.

Form. 33:
℞ Acid. Nitric. Dil. ♏xxiv
Tinct. Camph. Co. ʒj
Spt. Chloroform. ♏xij
Syr. Zingib. ʒj
Decoct. Hæmatoxyli ad ℥iss.
M. A teaspoonful every four hours.

Form. 34:
℞ Acid. Sulph. Dil. ʒss
Spt. Chloroform. ♏xx
Syrupi ʒij
Aquam ad ℥iss.
M. A teaspoonful every four hours.

Form. 35:
℞ Acid. Nitric. Dil ♏xx
Syr. Gummi Rubr. ʒij
Spt. Chloroform. ♏xx
Decoct. Hæmatoxyli ad ℥iss
M. A teaspoonful every four hours.

These prescriptions are suitable for children of a year old.

Form. 36:
℞ Ext. Belæ Liquid. ʒss
Syr. Gummi Rubr. ʒij
Tinct. Camph. Co. ʒj
Syr. Zingib. ʒij
Aquam ad ℥iss.
M. A teaspoonful three or four times a day.

Form. 37:
℞ Cupri Sulph. gr. ij
Liq. Opii Sed. ♏xxiv
Spt. Chloroform. ʒj
Aquam Cinnamomi ad ℥iij
M. Two teaspoonfuls three times a day.

For children six years of age.

(Form. 33), or sulphuric acid (Form. 34), with bark or chloric ether, may all prove useful in turn. Sulphuric acid, however, whether combined with an aromatic or sedative, has not answered my expectations, and I have been so frequently disappointed with it that I now seldom employ it. The syrup of red gum, combined with nitric acid and logwood (Form. 35), or with the extract of bael, are all useful (Form. 36). A dose of castor oil paste (Form. 23) may be needed to remove irritant matter from the bowels, and especially in those cases where exposure to cold has chilled the surface, and increased the congestion of the internal organs.

Sulphate of copper is another remedy to be employed with opium, and a few drops of spirit of chloroform in special cases (Form. 37).

In very obstinate cases, enemata of starch and opium may be necessary. I found no remedies administered by the mouth check the alvine discharges so effectually as one used night and morning in a case depending on mesenteric disease. In very obstinate cases Trousseau employs an enema of one grain of nitrate of silver dissolved in an ounce of water. In the dysenteric diarrhœa of children, Dr Ringer speaks favorably of salicylic acid used as an injection (1 to 300).*

This chronic diarrhœa indicates a relaxed state of the system generally and loss of tone. A tonic regime is consequently required, and frequently gives relief when other remedies have failed. Thus, change of air, by altering the surrounding circumstances, is often of incalculable benefit. Removal to the sea-side, or some dry and healthy locality, will accomplish more than any drugs when the case has assumed a chronic character and the bowels are irregular in their action. Cold baths in the morning, or if the little patient be very feeble, baths with the chill taken off, with friction and shampooing, tend to brace up the relaxed tissues. Benefit is frequently obtained from the use of cod-liver oil, steel wine, malt extract, and other remedies of a similar invigorating character. Every case of diarrhœa demands care, from its liability under neglect to lead to the severe forms we have described, or to originate mischief in the brain, or tubercle, or marasmus, as the general strength becomes more and more reduced.

Prolapsus ani.—In cases of long-continued diarrhœa the sphincter ani loses its contractility, and the surrounding parts become relaxed. When the diarrhœa is cured the local irritation ceases, and the child's bowels may act once or twice daily without any protrusion of the rectum. The treatment consists in sponging the relaxed parts with cold water, and if there is tenesmus, an opiate enema after the bowels act, will be of service. Another plan is to wash away all fæcal matter from the gut, and then apply a strong solution of alum before it is returned. When the gut remains protruded apart from any action of the bowels, gentle pressure with the finger dipped in oil will cause it to return. Cold water enemata every morning are serviceable in this state of relaxation. I have found great benefit from the use of sulphate of iron and infusion of quassia as a valuable astringent enema,[*] and the decoction of tormentilla has also been recommended. Where the prolapsus ani is not the result of diarrhœa, but is rather a chronic condition, it is well to hold the child in the hands whilst the bowels are being relieved, as, by so doing, the gut will rarely be forced down. If, on the other hand, the child is placed where its feet can reach the ground, it will make such powerful expulsive efforts as will commonly cause protrusion. Another plan is to keep the little patient lying on its back whilst the motions are passed. A compress and bandage may be worn during the day to prevent descent.

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* 'Handbook of Therapeutics,' 8th edit., p. 599.

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[*] Form. 38:
℞ Ferri Sulphat. ʒj
Inf. Quassiæ ℥viij } A fourth part to be used every morning.
M. Fiat enema.

CHAPTER XIV

GASTRITIS—MELÆNA—DYSENTERY

GASTRITIS—*Symptoms—Causes and treatment.*—SOFTENING OF THE STOMACH—*Nature and causes.*—HÆMATEMESIS AND MELÆNA—*Causes—Symptoms and treatment.*—DYSENTERY—*Symptoms—Causes—Pathology and treatment.*

GASTRITIS is of rare occurrence in children, and the symptoms are too obscure to enable us to diagnose the disease with any approach to certainty. The disease may be induced by irritating articles of food, and by swallowing corrosive acrid substances, or from any causes which excite indigestion or flatulence. The stomach may exhibit the evidence of gastric catarrh after death in those children who, during life, have had no symptoms of the disease, nor even disturbance of digestion.

The symptoms are distension and pain at the epigastrium, increased on pressure, vomiting of a glairy mucus or greenish secretion, and constant retching after food. If the disease goes on the child becomes thin and emaciated; there is thirst, and the tongue is covered with a thick, white fur; the pulse is frequent and small in acute cases, and there is constipation alternating with diarrhœa; but a subacute form of gastritis may be present, giving rise to no more symptoms than are ordinarily to be met with in irritative dyspepsia. If this continues, the nutrition of the child suffers, and it loses flesh and strength.

The *treatment* consists in giving cold water and sedatives after a careful regulation of the diet. Whilst pain and sickness continue, milk in small quantities at a time is the best form of nourishment, and it may be necessary to add a little lime water to assist digestion. For the relief of the profuse gastric secretion, Vogel* recommends half a grain of nitrate of silver, in three ounces of water as a mixture, of which two teaspoonfuls may be given to children from one to two years of age. For older children he gives a sixth of a grain of nitrate of silver.

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* 'Diseases of Children,' 1874, p. 141.

But gastritis, of a subacute character, demands that bland and non-irritating food should be taken, cold or iced water to allay thirst, and bicarbonate of potash and hydrocyanic acid as a sedative to the mucous membrane. If there is much irritability of the stomach a grain of calomel, with a few grains of tragacanth powder, divided into six parts, and given in the space of twenty-four hours, will be serviceable. Poultices may be applied to the epigastrium if the pain does not yield to the remedies mentioned, and enemata are preferable to purgatives.

In cases of gastritis produced traumatically the best treatment probably is that of opium and bismuth.

Softening of the stomach.—It is most important not to mistake the appearances found in the stomach after death, from the action of the gastric juice, with those that result from disease, or the introduction of irritating substances. The experiments of Hunter showed that the gastric juice after death was capable of discolouring the coats of the stomach, more especially in those persons who had died suddenly. As many individuals were quite well up to the time of death, he believed that these changes were caused by the action of the gastric juice after life was extinct.

In some instances, the process is limited to the mucous membrane, which is softer than usual, and breaks down under slight pressure of the finger; in other instances the morbid change is greater, and it extends through all the coats, by means of a soft irregular ulcer, the contents of the stomach escaping into the peritoneal cavity. The diseased process most frequently attacks the fundus of the organ, where the fluids gravitate, and the blood-vessels ramifying over the coats of the stomach are dark and congested, producing a condition resembling chronic inflammation. Adherent to the interior membrane may be seen an opaque or brownish tenacious mucus, which is easily removed on pouring over it a slight stream of water.

The disease appears to be not uncommon in infancy and early life, when gastric disorder is so frequent, but I am not able to refer to any symptoms, either in my own experience, or that of others, which would enable us to say during life, that softening of the stomach would be found after death.

Softening of the intestines has also been mentioned by writers on medicine, the mucous membrane becoming softened or destroyed down to the peritoneal investment.

Hæmatemesis and melæna vera.—Infants of a few days old suffer occasionally from vomiting or purging of blood, sometimes from both. Dr Rahn Escher considers that the hæmorrhage is greatest within the first twenty-four hours of life, usually ceases on the second day, but may continue to the fifth, or even later.

Causes.—In many cases it is impossible to find out the source of the hæmorrhage. Various opinions have been offered as to the cause of this rare and obscure condition. The disease would appear to depend chiefly on the physiological changes which take place at birth, when respiration becomes established, and the lungs, liver, spleen, and intestines are liable to become congested through an increase of pressure on the venous system; hence one reason, probably, why convulsions are frequent after birth in delicate children. Tedious labour and the pressure of instruments are mentioned as factors in the production of the hæmorrhage. Some cases are on record which show a hereditary tendency to bleed in the parents.[*]

Of twenty-two cases recorded by Rilliet and Barthez, twelve recovered. These were probably cases of pressure of the child's head during tedious labour, and congestion of the venous system from a difficulty in establishing respiration at birth.[†] The mortality is calculated to be about 60 per cent. (Croom.)

Pathology.—Some authorities consider the hæmorrhage as a crisis of the plethoric condition, and such cases would appear to be by no means uncommon in the newly-born, there being general congestion of the integuments and chief internal organs. Cases are recorded which show that it is sometimes due to blood change, as in purpura hæmorrhagica. Bouchut quotes from Billard (p. 497) the case of an infant, five days old, whose trunk, limbs, and arms were covered with violet petechiæ, and the yellowish spaces between them (from the slight jaundice which was present) gave the surface "a tiger-like aspect." After death, dark blood was found in the intestines and stomach, the spleen had ruptured from over-engorgement, and the heart was full of blood; the cellular tissues contained large ecchymoses, as did the kidneys and bladder; the pleuræ presented petechiæ, and the brain was congested.

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[*] "Melæna Neonatorum," by J. Halliday Croom, M.B., 'Med. Times and Gazette,' Oct. 23, 1880, p. 480.

[†] 'Traité Clinique et Pratique des Maladies des Enfans,' Paris, vol. ii, 1853.

After death, in ordinary cases, the internal organs have been found exsanguine, but healthy. Spiegelberg and Landau report cases in which abscesses were found in the duodenum, arising from embolism. Cases of this kind never recover (Halliday Croome, op. cit., p. 480).

The *symptoms* are prostration of the strength, pallor, rapid breathing, inability to suck, small pulse, and occasionally convulsions. Cases which survive the shock may end in diarrhœa, hydrocephalus, or mesenteric disease.

Blood drawn from the nipple in suckling (*spurious hæmatemesis*) must not be mistaken for true hæmatemesis.

Treatment.—This is unsatisfactory and uncertain; little if anything can be done. Astringent enemata, with cold water, where the hæmorrhage from the bowels is bright and active, or even cold applications to the abdomen, may be suitable in some cases. When faintness and exhaustion threaten, ammonia, ether, &c., will be required.

Dysentery.—Young children are sometimes seized with this disorder, but it is very rare, and it is not improbable that intestinal hæmorrhage has been mistaken for it. When the stools are slimy and contain mucus, there is an alteration in the intestinal mucous membrane, and if it lasts, more or less blood may be mixed with them. In some chronic cases the evacuations are little more than lumps of blood and mucus, dark in some instances, and pink or bright red in others. In aggravated cases, the bowel discharges become offensive, and of a slate-grey hue from containing portions of mucous membrane which have sloughed, and there is a discharge of pus indicating the presence of ulceration. Dysentery may begin as a primary disease, or as simple diarrhœa, and depend upon the same causes. The inflammatory form of diarrhœa (*entero-colitis*) is closely connected with it.

The *symptoms* resemble those of entero-colitis, but are more severe; they usually begin with violent sickness and vomiting, when the disease is acute, accompanied with shivering and pallor. The motions at the onset may be copious, and for the first few days of a bilious character, then they become more scanty and slimy, with glairy mucus resembling white of egg, and mixed with blood. Sometimes pure blood escapes, but generally it is mixed with the fæcal matter, which now and then escapes in lumps, causing griping pain in the abdomen, tenesmus, cramps in the thighs, and difficulty in micturition. There are abdominal pains and tenderness in the course of the colon, and frequently around the navel. Fever is seldom present unless the disease lasts some time, when the skin becomes harsh and hot, and the pulse frequent.

When the disease assumes a chronic form, the child becomes emaciated, and the bowel discharges are mixed with pus and blood; there are pieces of lymph in the motions, which are very acrid and offensive. The child is restless, and cannot sleep at night from pain and tenderness; there is gradual loss of flesh, prostration of strength, constant thirst, nausea, and disinclination for food Of thirty-six cases, recorded by Meigs and Pepper, four proved fatal. The complaint may terminate in peritonitis and ascites, in mesenteric disease and hectic fever, or in a sudden fit of convulsions. When the disease is progressing towards recovery, the evacuations become less frequent, and blood no longer appears in them; the child ceases to be feverish, and rests at night, whilst the appetite returns.

Causes.—The disease is more frequent in hot summer weather, when unripe fruit is eaten, and bowel disorders are common. Improper feeding, defective ventilation, scanty clothing, impure water, and exposure to cold and damp, are all capable of originating the disease. The influence of malaria, too, is to be reckoned as a cause, as well as the exanthemata, particularly measles and variola, and diseased intestine from typhoid.

Pathology.—In the acute stage of the disorder, the morbid changes are to be seen in the large intestine and rectum, as in entero-colitis. It resembles this disease, except that the changes in the rectum and colon are greater, and it often exists in an endemic and epidemic form. In some cases the small intestines are involved; the mucous membrane is swollen, soft, and reddened in patches or throughout its entire length. In some places it may assume a dark or gangrenous appearance. The follicles are enlarged. In the more advanced or chronic stage small round specks of ulceration form, which finally run together, and produce a ragged uneven appearance, varying in extent and depth. The mesenteric glands may be natural, or slightly enlarged and red. In long-standing cases the ulcers become contracted and surrounded by hardened tissue.

Treatment.—When the disease is recent, and sets in with acute symptoms, a warm bath is of great service, followed by poultices to the abdomen. The most absolute rest and warmth are demanded, and, if there is no vomiting, the castor oil paste (Form. 23), with a drop or two of laudanum, will be necessary to administer in order to clear the bowels of any scybalæ (Form. 24). If there be tenesmus and straining, an opiate clyster will give great relief. In some form or other opium is the most valuable remedy we possess in this complaint, as it controls the action of the bowels, allays pain, and procures sleep. Acetate of lead, catechu, krameria, sulphate of copper (Form. 29, 31, 32, 37), will at once come to our aid in turn, when the bowels continue obstinately irritable.

When calomel is employed, it should be given in very small doses at an early stage, in combination with opium or Dover's powder, but its use requires extreme caution.

Nitrate of silver has been recommended, in combination with a few drops of opium, given in some suitable vehicle, like mucilage or syrup. The eighth of a grain may be given to a child two years old every three or four hours.

As regards diet, if an infant, it should be kept to the breast, and no other form of food given. Older children may have barley water, sago, tapioca, rice water, &c., as mentioned under the treatment of chronic diarrhœa.

CHAPTER XV

CONSTIPATION AND COLIC

CAUSES OF CONSTIPATION.—*General debility—Diet—Deficiency of gastric, hepatic and intestinal secretions—Torpor of intestines from atony of their muscular fibres—A frequent accompaniment of cerebral disease—Hernia and intussusception.*—TREATMENT—*Regulation of diet—Laxatives—Aperients—Nitro-hydrochloric acid and taraxacum—Belladonna—Strychnia—Enemata.*—CAUSES OF COLIC—*Diet—Poisonous or irritating substances—Flatulence—Presence of scybalæ in intestines.*—SYMPTOMS AND DIAGNOSIS FROM PERITONITIS.—TREATMENT—*Castor oil and opium—Use of enemata—Hot poultices—Belladonna—Hydrate of chloral and bromide of potassium.*

CONSTIPATION is one of the commonest disorders of early life. When it occurs in infants it is a source of much trouble to the mother, who is sorely tried with the difficulty, because the child cannot thrive without a frequent action of the bowels. The younger a child is the oftener should the bowels act. In infants they are moved three or four times a day; and in children over one year there are generally two evacuations daily.

Among children artificially reared, constipation is a frequent ailment, particularly if they are feeble. There is a deficiency of intestinal secretion, so that by the time the motions reach the large intestine and rectum they are extremely hard and pebbly, and the child cries and undergoes painful straining to evacuate the hardened masses. Rest is not obtainable at night from flatulence, the belly becomes swollen, the legs are spasmodically drawn up, and then stretched out again. If this state of things is suffered to go on, the child may have a convulsion, or die worn out with pain and exhaustion. An accumulation of gas in the intestines may occur in these cases, especially where the secretion of bile is scanty, and those articles of diet are indulged in which cause fermentation. When the amount of mucus is sparingly secreted, the muscular fibre fails to propel the contents of the bowel, and hence constipation is common in such cases.

The colour of the fæces depends upon the admixture of bile, and the motions may be brown, green, or almost black, or like clay. When bile is deficient, the motions are pale; ordinarily they are of a gingerbread hue. The consistency also varies considerably; when the serous exhalation of the mucous membrane is excessive they are liquid; semi-fluid when the secretion is muco-gelatinous. The feculent matter found above the various intestinal strictures presents a peculiar frothy appearance.* Constipation in older children is sometimes caused by starchy compounds, as rice, arrowroot, tea, astringent and tonic mixtures. It often originates in the neglect of parents to inculcate the habit of getting the bowels to act at stated hours. Constipation is also a frequent accompaniment of cerebral disease, as meningitis, and hydrocephalus, in consequence of a loss of tone in the muscular fibre of the intestinal coats.

Constipation is sometimes observable in children when the liver is sluggish. The complexion is sallow and the appetite capricious, the motions are pale and contain scarcely a trace of bile. The tongue is coated, the urine scanty and high-coloured, and headache and lassitude are also common. These symptoms often arise from over-feeding and eating greedily.

I have elsewhere alluded to constipation as the consequence of hernia, intussusception, and intestinal obstruction.† Imperforate anus is another cause.

The *symptoms* generally met with in constipation are, distension of the abdomen from tympanites; the bowels having lost their contractile power, expand and push up the liver, stomach, and spleen, thus interfering with the descent of the diaphragm. In these cases, the abdomen after a time becomes painful, and the child is restless, the tongue is furred, the mouth hot, and there is sometimes vomiting.

In many simple and uncomplicated cases, the symptoms are not so marked, the abdomen is more or less tense, and there are scanty dry evacuations, heaviness of manner, loss of appetite and thirst. Habitual constipation may cause convulsions in young children.

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* Rokitansky, 'Path. Anatomy,' vol. ii, p. 110, Syd. Soc., 1849.

† See Chap. XVII—XVIII.

Whilst constipation is most common in delicate children, especially if brought up by hand, it is of frequent occurrence in strong children who are so reared; and hence I am inclined to credit injudicious feeding as a cause. I have over and over again seen the strongest and best developed children so attacked; they are plump, bright, and healthy looking, the only ailment being a painful straining in emptying the bowels. Now, in these cases, although the skin is of normal hue, and the conjunctivæ of pearly brightness, deficient biliary secretion is the essential cause of the evil; and until the liver pours out more bile, there is no probability of relief. When the liver has been stirred up by a mercurial purgative, the bowels have become regulated, and a recurrence of the evil has only happened with food, improper in quantity or quality.

Treatment.—No remedies will be of any use till we have ascertained the cause; and the first step to take under any circumstances will be a proper regulation of the diet. To prescribe drugs till this is inquired into will be a fruitless proceeding. Milk ought to enter largely into the dietary of young children, and weak animal broths in place of mucilaginous and starchy foods, with a liberal allowance of cold water. If the child is old enough, Scotch oatmeal with milk once a day is an excellent remedy to keep the bowels open. The oatmeal and treacle biscuits made by Scotch confectioners and bakers, or the so-called "Yorkshire parkin" is a famous aperient food for children. Prunes and senna are also serviceable, and if in season, a few grapes or a baked apple may be allowed. In infants and children of a few months old, the castor-oil paste is a safe aperient (Form. 23), relieving flatulence and exciting the action of the bowels. The syrup of rhubarb is another good remedy, and manna is a safe and mild laxative which infants take readily.* Manna may also be given in the form of paste with a little cream of tartar.† A suppository of common yellow soap introduced into the rectum at night will sometimes cause the bowels to act naturally in the early morning. A child delicate from birth suffered from constipation, passing motions resembling clay marbles in colour and shape; it was never easy day or night. All treatment failed to give relief till at six months old, malt extract, mixed with milk, was tried, and in a very short time the motions became natural and the bowels regular.

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* Form. 39:
℞ Mannæ Opt. ʒij
Aquæ Anethi ℥j. M.
} A teaspoonful once in two or three hours till the bowels act.
For children from four to six months old.

† Form. 40:
℞ Potass. Bitart. ʒss
Mannæ ℥ss
Aquam Anethi ad ℥iss. M.
} About gr. x or gr. xv for a dose, to be repeated occasionally.
For children from four to six months old.

In older children treacle and bread will often ensure a daily and regular action of the bowels[*] In strong children where febrile disturbance and heat of surface attend constipation, a few grains of sulphate of magnesia, with cinnamon which disguises the taste, will answer extremely well,[†] or (Form. 8), regulating the dose according to the age of the child. If the complexion is sallow, the urine turbid, or if the motions indicate a deficiency of bile, a little grey powder with rhubarb and bicarbonate of soda may be given with advantage for a few nights, and a citrate of potash mixture during the day. In some cases, if the belly is tumid and the hepatic secretion habitually defective, small doses of the perchloride of mercury may be ordered with tincture of cinchona and taraxacum. I have also seen excellent effects follow the administration of nitro-hydrochloric acid with taraxacum[‡] where the liver is sluggish, and the child is torpid and pale, and needs a tonic and alterative at the same time. The Pulv. Glycyrrhizæ Co. (Ger.), which contains sulphur, is an admirable aperient for children, and is not disagreeable to take.

Lastly, there are cases repeatedly met with where it should be our object to give as little aperient medicine as possible by the mouth, because the constipation depends on a laxity of the intestinal fibre. A judicious combination of belladonna and strychnia is to be recommended in obstinate constipation, but if in spite of these remedies and diet, the bowels remain persistently costive, a two-ounce enema of warm soap and water will rouse them to activity, and render soluble the fæcal masses which are lodged in the descending bowel and rectum. This may be used for infants and children of any age.

In every case of obstinate constipation, the finger well oiled, or an elastic tube, should be passed up the bowel to ascertain if any hernia or mechanical obstruction exist. If it does, all treatment by the mouth will be unavailing until it is removed.

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[*] See Chap. II.

[†] Form. 41:
℞ Magnes. Sulph. ʒj
Syr. Rhei ʒss
Tinct. Cinnam. Co. ʒss
Liq. Magnes. Carb. ad ℥iss. M.
One or two teaspoonfuls occasionally.
For children from four to six months old.

[‡] Form. 42:
℞ Acid. Nitric Dil. ♏xvj
— Hydrochl. Dil. ʒss
Succi Taraxaci ʒj
Syrupi ʒss
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.
For a child three or four years old.

Experience, however, teaches us the danger of too active interference in cases of constipation, unless urgent symptoms are present; the bowels may be torpid for days or weeks together in exceptional cases, without danger to life.[*]

Colic is a common complaint in young children. It consists in painful contraction of the intestinal coats, and is caused by the accumulation of hard fæcal matter in the bowels, or some irritant food, or substance lodged in the intestines. Slight attacks in infants are not uncommon from excessive acidity in the stomach, forming milk into a hard indigestible curd. In children it is frequently induced by eating unripe gooseberries or other indigestible fruit, and drinking large quantities of cold water when the stomach is empty and the body heated. Worms in the bowels, internal strangulation, or obstruction are severally capable of causing the disorder. Colic often accompanies diarrhœa in young children. Exposure to cold is another cause, and so is bathing in too cold water.

The *symptoms* are sudden twisting pain in the abdomen, generally in the direction of the transverse colon, and coming on in paroxysms. The child draws up the legs and bends the body forwards to relax the abdominal muscles. There is generally flatulence, but the suffering may be intense, without any distension whatever, and with even retraction of the umbilicus. When the gas which is naturally formed in the stomach and intestines is not expelled by the anus, then the delicate muscular structure of these organs yields, and the abdominal wall becomes distended and tense. In typhoid fever and some other affections in which the ganglionic system is severely implicated, there is a drum-like distension of the intestines (meteorism) accompanied with quick shallow breathing, and increased action of the heart. The abdomen is not equally distended; it may be conical along the centre, and the small intestines be more involved than the colon in certain cases. In the latter class, fæcal matter or undigested food is the chief cause of the pain. In addition to the symptoms just enumerated, the child shrieks out with the pain, the angles of the mouth are drawn down, and the face is pitiable. Syncope and even convulsions may happen in severe cases.

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[*] Mr John Gay has recorded a case of obstinate constipation in a boy seven years of age, of healthy appearance, who was admitted into the Royal Free Hospital, in July, 1853. Four years previously he had an attack of typhus fever, accompanied with pain and tenderness. On recovery his bowels were torpid, and purgatives and enemata were needed to procure evacuations from them. "During the three months prior to his admission, nothing whatever passed from his bowels." Neither his health nor appetite suffered, and he had only been sick on one or two occasions in consequence of taking unwholesome food. The umbilical measurement increased to forty-nine inches without material inconvenience to the respiratory organs. Along the left side of the body was a prominent swelling, corresponding to an enlarged descending colon. One remedy after another failed to dislodge any fæcal matter, and at last a speculum was introduced into the rectum, and the sphincter dilated; then the tube of an enema syringe was passed high up into the bowel, and a stream of warm water kept constantly playing for half an hour upon the contents until they were dissolved. These repeated operations brought away hard and fæcal matter, like hard cinders, and soon reduced the size of the abdomen to that of twenty-six-inches in circumference.—*Path. Trans.*, vol. v, p. 174; also Holmes's 'System of Surgery,' loc. cit.

The disease is to be distinguished from peritonitis by the suddenness of the pain, and the freedom from suffering between the paroxysms; by the quietude of the pulse, the absence of fever, and the relief obtained from pressure. Most practitioners must have observed children when pale with agony, throw themselves across a chair to obtain the relief which that pressure affords.

Treatment.—If the case is one of simple colic, and we consider the pain to be due to muscular contraction, it will be advisable to keep the bowels quiet till the pain is relieved. To attain this end flannel wrung out of warm water should be applied to the abdomen, or repeated poultices. I have found a mixture of carbonate of magnesia and spirit of chloroform with peppermint water very serviceable, particularly if the bowels are distended. When the pain is mitigated, and it is desirable to act upon the bowels, a dose of castor oil with tincture of opium, and two or three minims of spirit of chloroform will be indicated. In infants at the breast, troubled with colic, it is often well to give the mother, or nurse, some carbonate of magnesia; in other cases where the milk is too firmly curdled by excessive acidity in the stomach, and who "possett"[*] a portion of this curdled milk, cajeput oil with potash is useful.[†]

A copious injection of warm water with a little oil will often produce speedy relief. When colic seems to arise from indigestible matter in the stomach, an emetic of ipecacuanha may be given.

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[*] This is a provincialism for which we have no equivalent in ordinary English; it means when a portion of the milk curdled by the stomach is ejected by the mouth.

[†] Form. 43:

℞ Potass. Bicarb., gr. viij
Ol. Cajeputi ♏viij
Aquæ Anethi ℥j. M.
} A teaspoonful three times a day.

If there are symptoms of obstruction, they must be dealt with in accordance with the instructions under that heading,* enemata may be tried, and if these fail, the little patient must be kept under the influence of opium and belladonna. The latter drug is said to be very serviceable in the colic of children.† Hydrate of chloral and bromide of potassium are also useful, by relieving spasm and inducing sleep.

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* See Chap. XVII.

† 'Handbook of Therapeutics,' by S. Ringer, M.D., 4th edit., p. 502.

CHAPTER XVI

Diseases of the Cæcum and Appendix Cæci—Typhlitis and Perityphlitis—Diagnosis and Prognosis—Disease of the Appendix Vermiformis—Causes—Symptoms—Treatment.

Diseases of the Cæcum and Appendix Cæci.—These are so important that it is well to allude to their anatomical position. The cæcum is situated between the ileum and the ascending colon in the right iliac fossa, and is connected by loose cellular tissue with the iliac fascia beneath. The peritoneum passes over its anterior surface. It is about 2½ inches in length, and is much larger than the ileum. At its extremity is attached a worm-shaped tube, or elongated sac, having the diameter of a goose-quill—the *appendix vermiformis.* In length it varies from 1 to 5 inches, but ordinarily it is about 3 inches in length, and pours out a secretion like mucus, which keeps the fæces soft at this part. A diminished quantity of secretion is most probably one cause of the accumulation of hardened fæces, which often leads to disastrous consequences. Distension of the cæcum and ascending colon from accumulation of fæces, may from pressure above on the last dorsal and genito-crural nerve, cause pain over the hip and down the thigh. Walking will cause pain, or an attempt to stand upright. With this state, there is often associated headache, depression of spirits, sallow skin, owing to the liver and bowels not properly performing their functions.

Typhlitis and Perityphlitis.—These diseases consist in inflammation of the coats of the cæcum, and of the tissues above and around them. Many cases seem to have followed excess in eating. They may occur without apparent cause, or follow diarrhœa or constipation. Falls from a height, blows on the abdomen, exposure to damp and cold, impacted fæces, or foreign bodies in the cæcum are common causes. The mucous membrane becomes congested, and the fæces are not carried along as in health, so that a swelling or tumour can be felt over the iliac fossa. In some cases, general peritonitis, the consequence of ulceration, ensues, accompanied with severe pain, failing pulse, clammy sweats, and death in a few hours.

Symptoms.—These are sometimes very insidious; indigestion, loss of appetite, furred tongue and high-coloured urine may only be noticed at first. But soon succeed pain and tenderness over the right iliac fossa, colicky pains in the abdomen, vomiting, and febrile disturbance, constipation, or diarrhœa. In some instances the symptoms are severe from the commencement; the patient lies on his back or right side, with his thigh semi-flexed to relax the abdominal muscles. Swelling about the hip and inguinal region, obliterating the fold of skin in the latter situation, is sometimes noticed, or an oval-shaped tumour may form above Poupart's ligament.

Diagnosis.—This is sometimes very difficult, or even impossible to determine in cæcal disease, but sudden localised pain and tenderness in the right iliac fossa, with more or less swelling, vomiting, and constipation would create suspicion. It may be mistaken for hip disease,[*] or ovaritis in young girls, who have begun to menstruate, or to the passage of a renal calculus.[†] A blow on the abdominal parietes may lead to suppuration among the muscles and local peritonitis, without cæcal disease.[‡] Some cases are very obscure, and for a few days the sickness and constipation of the bowels are put down to a common bilious attack, and aperients are perhaps resorted to which only tend to hasten the inflammation which so frequently arises. When the foreign body is lodged in the appendix vermiformis and the cæcum remains free, the diagnosis is next to impossible, and death is inevitable.

Prognosis.—This is generally favorable, unless the disease leads to perforation of the cæcum and peritonitis. If abscess form, it may open into the bowel, or externally through the abdominal wall, the chance of recovery being greater in the former than in the latter. In those cases where cherry stones, pins, or fæcal matter have lodged in the appendix, inflammation and ulceration have arisen and caused death.

Disease of the appendix vermiformis is a serious affection. A concretion lodged in it may induce inflammation, ulceration, and fatal peritonitis. A medical friend of mine saw a fatal case in a boy from the impaction of a cherry stone in the appendix, and my colleague, Dr Prickett, met with a case in a girl fifteen years of age, caused by swallowing a pin, which had worked through the appendix, and produced symptoms like typhoid fever, terminating in suppuration and localised peritonitis. A piece of hard fæcal matter has been known to ulcerate through the appendix and cause peritonitis and death. I once met with a case of cæcitis which appeared to follow violent sea-sickness. Dr Dewes showed before the Birmingham and Midland Counties Branch "a small mass of impacted fæces taken from the appendix vermiformis, where it had caused ulceration, peritonitis, and death."[*] I have recorded a case which came under my notice in a boy, fourteen years of age, where inflammation of the appendix was set up by the presence of three small pieces of fæcal matter, the largest the size of a bean. This was followed by peritonitis and death. The post-mortem in addition to this revealed a pint of purulent matter in the abdominal cavity.[†]

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[*] "Perityphlitis in Children," 'The American Journal of the Medical Sciences,' by V. P. Gibney, M.D., 1881, p. 119.

[†] See Chap. XXIII.

[‡] 'On Diseases of the Alimentary Canal.' By S. O. Habershon, M.D. 1857, p. 207.

Dr Lewis mentions 47 cases of abscess, and other diseases of the appendix vermiformis, consequent on lodgment of foreign bodies there. The ages were, under 5, four; between 5 and 10, two; between 10 and 20, thirteen; between 20 and 30, six; between 30 and 40, three; between 40 and 50, four; between 50 and 60, three; aged, one; elderly, one; young, two. Only eight of the forty-four patients whose sex was named were females; eighteen had good constitutions; seven were delicate. One half the patients so affected die.[‡]

M. Leudet says ulceration of the appendix vermiformis is frequent in phthisis, accompanied by lesions of the cæcum and chronic enteritis. The causes of the perforation are ulceration in enteritis, pulmonary phthisis, typhoid fever, foreign bodies, and in some eruptive fevers. General peritonitis is so rare that it occurred only once in forty-three cases. Circumscribed peritonitis is more common, and may be confined to the noose of intestine, or between it and the abdominal wall. The purulent collection may be limited to the iliac fossa. The rarer terminations are the circumscribed peritonitis opening outwardly, adhesion of the appendix to the cæcum and small intestines, rectum, and bladder. Perforation is not necessarily fatal.*

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[*] 'Brit. Med. Journ.,' Nov. 5, 1881, p. 757.

[†] 'Medical Society's Proceedings,' 1882.

[‡] "On Abscess in the Appendix Vermiformis," 'Medical Times and Gazette,' vol. i, 1857, p. 145.

Disease of the appendix vermiformis sometimes arises without apparent cause. Agonising pain, attended with the vomiting of dark green offensive fluid, sets in, and death quickly follows. Such a case is related in a boy, nine years of age. The post-mortem examination showed that the cæcum was healthy, and that the appendix was thickened and club-shaped towards the end, three-quarters of an inch from which was a large, sloughy, ragged perforation, nearly dividing the process across.†

Treatment.—As soon as there is any suspicion of this formidable affection the patient should go to bed and maintain the most perfect rest. The early symptoms are often overlooked, and we do not become aware of the real state of things till inflammation has set in. If pain and tenderness are acute, it will be advisable to apply three or four leeches over the cæcum, followed by warm and light poultices. Opium to relieve pain, in small doses, given by the mouth, or, what is preferable, a few drops of laudanum thrown into the rectum. The food should be light and unstimulating. When the pain is relieved, and inflammation is absent, enemata may be used, or even a mild laxative if the body is soft, and there is no vomiting, but the greatest care is necessary in the use of aperients. In the more chronic cases resolution has been brought about by the employment of vesication. If an abscess forms it should be opened antiseptically. It has been suggested by Dr Mahomed that in recurring perityphlitic attacks from concretions in the appendix vermiformis, a similar incision to that employed in ligature of the external iliac artery might be made to liberate the concretion in the appendix when the acute symptoms have subsided.‡

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* 'Medical Times and Gazette,' 1859, vol. ii, p. 561.

† Two Cases of Sloughing and Perforation of the Appendix Vermiformis," 'Medical Times and Gazette,' 1857, p. 84.

‡ Clin. Soc., Oct. 10, 1884.

CHAPTER XVII

INTESTINAL OBSTRUCTION

CAUSES—*Intussusception—Fæcal accumulation and foreign bodies —Hernia—Malformations of rectum and anus—Diverticula and congenital strictures—Clinical records of these affections —Diagnosis of rarer forms of obstruction.*—TREATMENT—*Reduction of any hernial protrusion—Abdominal section to disengage the bowel—Enemata.*

BY obstruction of the bowels is to be understood an interruption to their functions, arising either from causes acting from without, as in hernia or volvulus; from within, as in fæcal accumulation, or directly implicating the walls of the intestine, as in stricture.

Intussusception is the most frequent cause of acute obstruction in childhood.*

Next to this, hernia is not uncommon in children as a cause of obstruction, but the protruded intestine does not often become strangulated before adolescence. In obscure cases of obstruction, before resorting to extreme measures, it is advisable that a surgeon should examine the abdomen in the regions where hernia may occur. Mr Howard Marsh tabulates forty-seven cases of strangulated hernia in children, giving as full details as he could glean from the original records of each case. This valuable table accompanies a paper in which the author discusses the subject at length.†

In cases of obstruction in new-born infants the practitioner may find that he can pass his little finger into the anus. That being the case he must still bear in mind that the rectum may be imperforate some distance above the anal aperture.

The most puzzling forms of acute obstruction that are met with in childhood are those due to certain congenital malformations of the intestinal canal. From time to time such cases come under the notice of the physician.

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* See Chap. XVIII.

† "Reports illustrating the Surgery of Childhood," 'St Bartholomew's Hospital Reports,' vol. x.

In children and adults no trace can be found, as a rule, of the fœtal omphalo-mesenteric duct. But it sometimes remains as a diverticulum from the ileum.[*] Close to this abnormal outgrowth the intestine itself is often very narrow, not from any morbid deposit in or outside its coats, nor yet from ulceration and cicatrization, but purely from ill-development.

An interesting case is recorded of "Intestinal Obstruction caused by a Hernia through the Mesentery of a Meckel's Diverticulum, which had retained its attachment to the umbilicus." The patient, a boy seven years of age, was seized with severe pain at the umbilicus, relieved by the sitting posture. He had occasionally suffered from attacks of pain. Vomiting set in on the third day, and continued with varying severity throughout the illness, but it was never fæcal. The urine was scanty, and of high specific gravity. Paroxysms of pain occurred from time to time, and enemata brought away fæcal masses. The pain abated on the fifth day, but on the following, increased distension of the belly took place, and he died. After death, commencing peritonitis was discovered, and "about two feet of the lower part of the ileum were found hanging in a collapsed condition on each side of a cord-like loop. This loop was formed in the mesentery of a well-developed diverticulum, the upper end of which was attached to the umbilicus by an impervious cord half an inch long, the diverticulum itself being four inches in length. The gut, where it passed through the loop, was constricted and pale, but a small projecting portion at the origin of the diverticulum was of a deep purple colour."[†] Two cases of fatal obstruction, one in a girl of thirteen, are recorded by Dr Southey, from congenital constriction of the gut, at the point of departure of diverticula, the remains of the omphalo-mesenteric duct.[‡]

Very frequently the diverticulum itself is the cause of mischievous or fatal complications. It may adhere to some part of the abdominal wall, and drag the intestine to such an extent as to completely obstruct it. This occurred in a child of ten, in Dr Wilks' experience.[§] Sometimes the diverticulum becomes adherent by a band of lymph to the mesentery, forming a loop in which a knuckle of intestine may become strangulated; this has been observed in a child aged four.* In other cases the diverticulum may become filled with foreign bodies, or undigested food, and fatal obstruction with perforation of the morbid outgrowth may ensue, as in a specimen exhibited before the Pathological Society.†

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[*] For the anatomy of this condition, see Struthers, "On Diverticula from the Small Intestine," 'Edin. Med. and Surg. Journal,' 1854.

[†] Clin. Soc., Oct. 22, 1880.

[‡] 'Trans. Clin. Soc.,' vol. v, pp. 159—163.

[§] 'Trans. Path. Soc.,' vol. xvi.

Diverticula may become perforated in typhoid fever.‡

A displaced appendix vermiformis may become united to the bowel, forming a band, and ultimately causing obstruction.

When internal strangulation is caused by bands, &c., the symptoms are usually acute; the child lies on its back with its knees drawn up, the pain is sharp and agonising, and vomiting sets in early; the tenderness of the abdomen is extreme and the slightest pressure cannot be borne, for peritonitis is frequently present; the pulse is small and quick, the respiration thoracic and hurried, and the constitutional disturbance is very great. If a portion of intestine is tightly encircled at the strictured part it soon thickens, inflames, and even mortifies.

As for chronic obstruction, the physician should be on his guard in watching all disorders in which it may take place. It often accompanies intractable tubercular disease of the peritoneum in ill-fed children.

Treatment.—If a hernia exists and can be discovered, it should be reduced, and after this an enema of oil or gruel should be employed. If the symptoms point to internal strangulation, and a diagnosis can be established, the abdomen should be opened that the constricted intestine may be set free. If any abdominal swelling points to fæcal accumulation in the cæcum, or large intestine, enemata of castor oil and poultices to the abdomen should be used, and it may be necessary sometimes to remove the hardened masses from the rectum with a scoop. In some cases of abdominal obstruction attended with inflammatory symptoms, it may be necessary to employ a few leeches to the abdomen, and give full doses of opium and belladonna.§

A case is recorded where a child three days after birth had passed no motion. As the finger could only be introduced an inch within the rectum, the case was looked upon as one of imperforate anus, and an operation was performed. Two days later, the child died from peritonitis. A post-mortem examination showed that the obstruction was due to a volvulus situated two feet above the ileocæcal valve.[*]

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* Holmes' 'System of Surgery,' vol. iv, Art. "Diseases of the Intestines," by George Pollock, Esq., p. 610.

† 'Trans. Path. Soc.,' vol. xxiii.

‡ 'The Lancet,' Nov. 10, 1877.

§ See Chap. XV, "On Constipation and Colic."

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[*] 'Brit. Med. Journ.,' vol. i, 1880, p. 788.

CHAPTER XVIII

INTUSSUSCEPTION—INVAGINATION

MEANING AND DEFINITION—*Two forms described*—1. *Simple intussusception, slight or spasmodic—Case in illustration*—2. *Severe or inflammatory forms.*—ANATOMICAL APPEARANCES—CAUSES—*Diarrhœa the commonest cause.—Constipation—Blows upon the abdomen or sudden jerks on the body—Weight of a tumour dragging down part of intestine.*—SYMPTOMS—*Course and terminations—Persistent vomiting frequently present—Tenesmus and bloody mucus.*—DIAGNOSIS—*From local enteritis—Internal strangulation—Simple colic—Vomiting—Amount of urinary secretion as a means of diagnosis—Impacted fæces—Typhlitis, &c.*—TREATMENT—*Enemata—Inflation—Dangers of purgatives—Gastrotomy.*

INVAGINATION belongs particularly to infancy and early life, and is one of those disorders that demands prompt and judicious treatment. Fortunately its frequency bears no relation to its invariable painfulness and danger. The malady essentially consists in the passage or inversion of one portion of intestine into another; just in the same way as one tube may be slipped into another, or, what is a better illustration, the end of a glove-finger or stocking, pushed within the upper portion. The effect of this invagination is not primarily strangulation, or arrest of the circulation, but obstruction to the passage of the intestinal contents. Sir Thomas Watson observes, however, that "The contain*ed* portion of intestine is liable to be nipped and strangulated by the contain*ing* portion, and all the peril of hernia results, with much less chance of relief by art. This state of things is called intussusception."*

Intussusception may be divided into—1. Simple, slight or spasmodic cases, where the invaginated intestine has not been sufficiently irritated to become inflamed. 2. Severe cases, where the involved portion has inflamed or sloughed.

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* 'Principles and Practice of Physic,' 1857, vol. i, p. 40.

The first variety is unattended by inflammation, and may be considered mainly due to spasm. Slight intussusceptions have been found in the bodies of children who have had no symptoms of such displacement during life, and who have died from other forms of disease. Invagination of the small intestine is not unfrequently found at the autopsies of children who have died during the period of dentition, or from diarrhœa, without any symptoms of intussusception.[*] Billard has seen it in cases of constipation, and Lewis Smith in infants who had had subacute or chronic entero-colitis.[†]

The intussusception in some cases is slight enough to make it probable that no trace of inflammation or even congestion is present. The invaginated mass is usually from half an inch to two inches in length, and, as a rule, this accident is multiple. There may be ten or more distinct intussusceptions at distances of a few inches from each other. In the Museum of the College of Surgeons there is a specimen of a portion of the small intestine of a child four years of age, in which three intussusceptions are to be seen, all close to one another.[‡]

An intussusception involves three layers of intestine. The innermost consists of the invaginated upper portion of intestine, its mucous layer is internal, and the peritoneal external. The middle or inverted portion also belongs to the invaginated segment, and is reflected below from the lower limit of the inner layer, and above is continuous with the upper margin of the outer layer. From its inversion the mucous membrane lies external to its peritoneal coat. The outer layer consists entirely of that portion of intestine into which the former two have intruded themselves. Above, it is reflected upon the middle layer, with which, in fact, it is there continuous. Its mucous surface is innermost, facing that of the middle layer.

The portion of intestine that is inverted becomes most inflamed and swollen, whilst that which enters suffers in a less degree. When the volvulus is considerably inflamed its mucous membrane may be pale notwithstanding; its sheath or investment is only slightly affected in small intussusceptions with the exception of some peritonitis at the point of entrance.[§] When the intestine is effectually incarcerated its vessels become engorged, and the obstruction is complete; all the three layers of intestine become swollen and deeply congested from extravasation of blood; the serous surfaces become inflamed, lymph is effused between them which leads to adhesion, whilst the two mucous surfaces being also in contact, mucus and bloody serum are thrown out into the intestine, which escaping by the rectum become a valuable sign of intussusception.

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[*] Meigs and Pepper, 'Diseases of Children,' Art. vi, "Intussusception," p. 463.

[†] Lewis Smith on 'Diseases of Children,' Philadelphia, 1869, p. 419.

[‡] No. 1365, Pathological Series.

[§] Rokitansky, 'Path. Anatomy,' p. 57.

A good example of the spasmodic variety of intussusception unattended by peritonitis or actual constriction, came under my care in January, 1875. The child, a female, 2 years and 9 months old, was in good health on the day previous to my visit. I found her in bed, very flushed and excited, skin hot and sweating; temp. 103·0°, pulse 160; respirations quick and shallow. She lay with her legs extended, and complained of pain over the abdomen; the belly was rather tympanitic, and the bowels had only acted scantily on the two previous days. There was no vomiting. On the following day (Jan. 5) the child had been sick, and was in a good deal of pain. An enema of warm water returned as injected. A gum elastic catheter was introduced into the bladder, and six ounces of clear urine were drawn off. On the 6th and 7th there was a good deal of tympanites over the stomach and umbilicus, but nothing marked over either iliac fossa. The symptoms were considered due to intussusception, though no cause could be ascertained beyond a sudden change to a more luxurious and mixed diet than the child had been accustomed to. The urine was again drawn off. One minim of tincture of belladonna was prescribed every four hours. On the 8th, at the upper constricted part of the rectum (left sacro-iliac symphysis) something hard could be felt protruding through it for about an inch, and between the rectum and bladder, at its upper part, was an elastic fulness, which was probably a distended convolution of small intestine. A soap-and-water enema, with two ounces of infusion of rhubarb, speedily returned as it was thrown up. Shortly after this, a repetition of the enema brought down a mass of feculent matter. On the 13th the pulse was weak and thready, there was more pain and tympanites, with tenesmus, but no motion. I attributed the increase of pain and swelling to the bowel, after recovery from the invagination, again slipping down into its old position. On the 15th the bowels acted slightly three times, and on the 16th and 17th copious motions were passed, attended with griping and twisting pains about the umbilicus.

From this time the bowels acted regularly, and the patient slowly recovered her health.

In this case the degree of constriction was too slight to entirely prevent the passage of the intestinal contents, and the chief danger lay in death from exhaustion rather than from obstruction. The normal vermicular movement of the intestines in these slight cases has the effect of restoring the invaginated gut to its proper place, when rest and appropriate measures are adopted.

The *second variety of intussusception* is that which chiefly concerns us, by producing very positive and unmistakable symptoms, in addition, in some cases, to a defined abdominal tumour, and the partial protrusion of the invaginated intestine (sausage-like in shape) into the rectum, within reach of the surgeon's finger.

A mass of coagula may be mistaken for an intussusception, as in a case recorded by Mr Morris, in the twenty-eighth volume of the 'Path. Soc. Trans.,' where an intussusception of the ileum actually existed, but this did not involve the large intestine, which was full of clots.

In genuine intussusception, it is the upper segment of the bowel that is almost invariably forced into the lower. Brinton doubted whether the contrary can ever occur. Ascending intussusception,[*] however, is spoken of by some writers.[†] Handfield Jones and Herbert Page describe a case where both varieties co-existed, and "the extremities of the two intussusceptions overlapped each other.[‡]

The proportion of frequency with respect to age goes to show, that of twelve specimens in children noted in the Museum of the College of Surgeons, two were aged respectively four years, one a year old, and none of the remainder exceeded ten months.

The proportions of frequency in the different parts of the canal which are liable to this displacement are as follows, according to Brinton:[§]

Ileum and cæcum into large intestine, 56 per cent.

"Half the large class of ileo-cæcal intussusceptions are infants under seven years of age, many but a few months old."

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[*] In the Museum of the College of Surgeons is a specimen of a cat's intestine, with an ascending or retrograding intussusception close to one of the ordinary variety.

[†] Meigs and Pepper, p. 463.

[‡] "A Case of Intussusception in which Abdominal Section was performed," 'Med.-Chir. Trans.,' vol. lxi.

[§] 'Intestinal Obstruction,' by Wm. Brinton, M.D., F.R.S., edited by T. Buzzard, M.D.

"Small intestine invaginated into a lower part of small intestine, 32 per cent."

Colon intussuscepted into itself, 12 per cent. (According to Rokitansky, however, "Intussusceptions occur with equal frequency in the colon and small intestine.")

"The rectum scarcely ever forms more than the outer layer of an intussusception which has descended into it from above."

Brinton believes that the sloughing-off of an intussusception is not complete on an average before the eighth day, and the liberated bowel is not expelled till two days later. When primarily fatal, death commonly takes place in about five days and a half.

The average duration of the cases directly fatal, appears to be the same in the different varieties, five days and a half.

Anatomical appearances.—There are numerous specimens of intussusception at the Museum of the College of Surgeons, showing the direction which the displaced intestine takes. In nearly all cases from the human subject, it is of the descending variety, or in a direction downwards.

In infants, the lower end of the ileum suffers most frequently. This is owing partly to the looseness of the attachment of the cæcum in the right iliac fossa, and the imperfect development of its muscular coat in early life, which allows the ileum to slip through the valve.

Causes.—Intussusception in very young children may arise from many disorders of the alimentary canal, especially diarrhœa; indeed, this is a common cause in infants; even in older children, diarrhœa, muco-enteritis, and dysenteric discharges are capable of originating the complaint. In a large number of cases it cannot be denied that derangement of the functions of the intestinal viscera precedes the displacement, and since it happens so frequently to young children, it may be accepted as a certainty, that irregular contraction of these viscera from the ingesta is a common cause of the disorder. This abnormal involution appears to arise from sudden and spasmodic contraction of a portion of intestine, which is forced onwards into a portion less contracted or altogether flaccid. Although it occurs at all periods of life, Dr Habershon considers it more frequent in youth and infancy.*

Of 52 cases tabulated by Dr Lewis Smith, the health was recorded before the invagination in 34; of these 34, the previous health was good in 17, and deranged in 17; the previous health in most of the 17 consisted of diarrhœa or dysentery, or diarrhœa alternating with constipation; others had threadworms, obscure abdominal pains, nausea and vomiting. One child had symptoms of invagination at ten weeks old, which passed off.[*]

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* Op. cit., p. 318.

The male sex is most liable to the complaint, and of 34 cases, 23 were boys (Lewis Smith).

The liability of young children to the disorder is in a great measure due to the delicate structure of the walls of the intestines, which are imperfectly developed in infancy, and to unsteadiness in their movements.

It is not proved that intussusception is due to congenital laxity of the meso-cæcum or meso-colon.

Among the exciting causes, blows and contusions of the abdomen have produced diarrhœa and constipation, followed by invagination; violent fits of screaming, and straining at stool have induced the complaint. Tossing the child up in the arms suddenly with a jerk, and then bringing it quickly to the ground may cause intussusception (Rilliet and Barthez).

The simple form of intussusception is usually situated in the small intestines, and very rarely in the colon; in the more aggravated form the ileum is generally invaginated into the colon. The latter is, as Brinton has shown, the most frequent.

The bowels may act as many as four or five times a day, and the child die notwithstanding, and after death the invaginated intestine may be from one to two feet long. The bowels may remain pervious for weeks, and then death ensue.

Symptoms.—These vary in severity according to the age of the child and the cause which may have produced it, but griping paroxysmal pain, pallor, faintness, and constipation, are common in most cases, increasing after a few days when enteritis is established. At first, as in the case of simple invagination related, pressure is borne by the hand, and the little patient may have comfortable snatches of sleep; but if the invagination continues, the symptoms assume a more aggravated form, and inflammation, marked by great abdominal pain, vomiting and tenesmus, arises in the displaced portion of intestine. If the child is very young, convulsions may supervene,[†] and even if this complication does not arise, the child soon loses flesh, the face is pinched and haggard, and the eyes dark and sunken. Vomiting is a frequent symptom, and cases are rare where it is not present; at first the contents of the stomach are simply rejected, and afterwards the ejecta are grass-green, and ultimately become stercoraceous, as in the well-known vomiting in cases of strangulated hernia. After a day or two, the bowels generally cease to act, and a few more scanty evacuations will not in these cases prove that the bowels are not obstructed, for the excrementitious matters may issue from below the seat of obstruction. These scanty motions are generally tinged with blood, including much mucus, and are very characteristic. But as Mr Marsh has pithily remarked in regard to the case of a young child in his own experience, even though intussusception involves a considerable length of intestine, it does not necessarily produce any symptoms beyond those that commonly attend slight catarrhal enteritis. The development of symptoms depends upon the degree of constriction. An intussusception is like a hernia which may be "down" without being strangulated or even obstructed.*

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[*] Lewis Smith, op. cit., 1869, p. 420.

[†] Dr Habershon records a case of intussusception where convulsions and insensibility followed constipation, vomiting, and pain in the abdomen, in a boy six years of age.

A solid cylindrical tumour may generally be detected by careful examination. It is most frequently found in the right iliac or hypogastric regions, sometimes it can be felt by passing the finger up the rectum, but it may be obscured by tympanites due to the enteritis which it produces. When it can no longer be distinguished after having once been detected, it may have shifted, but more frequently it has sloughed off.

Diagnosis.—In endeavouring to form a right conclusion as to the cause of the symptoms of obstruction, we must not hastily infer that they arise from intussusception. If they are due to invagination we may expect to find obstinate constipation, occasional vomiting, straining to go to stool, and bloody mucus from the anus. If, in addition to these symptoms there is a tumour of oblong shape in some part of the abdomen tender to the touch we may be nearly certain of the condition. It may be impossible to distinguish the vomiting, feeble pulse, tympanites, and worn look from local enteritis or internal strangulation, but when mucus and blood are passed per anum it greatly assists the diagnosis.

This form of obstruction is usually indicated by the sudden

Notwithstanding that he passed the cæcum, together with the vermiform process and ascending colon, in a motion, he completely recovered.—Op. cit., p. 337.

* "A Case in which Abdominal Section was performed for Intussusception," 'St Barth. Hosp. Rep.,' vol. xii.

accession of pain, by its coming on in paroxysms, and by its sudden subsidence. Unlike colic, the sensation of twisting and grinding is not so great, but the pain is more continued in severe cases, in consequence of the violent action of the muscular fibre to overcome the obstruction. These symptoms, as previously alluded to, depend on the degree of constriction, and consequently vary in severity.

Let it also be borne in mind, that in forming a diagnosis we should recollect that hardened and impacted fæces, typhlitis, hæmorrhage, dysentery, limited peritonitis, producing adhesion or impaction of intestine, may all be mistaken for the condition we are describing; and that the symptoms belonging to each of these states must be carefully observed and compared, for the diagnosis is not unattended with difficulty.

When the obstruction is high up the urinary secretion is more scanty than when it is situated lower down; but this symptom cannot be much relied on. Much less can we place any reliance on the statement that vomiting comes on earlier and is more distressing when the obstruction is high up in the intestinal tube.

Intussusception may end fatally in a few days, or terminate in recovery in three weeks. In infants the disease is almost invariably fatal.

Intussusception of the small intestine is readily distinguished from the ileo-cæcal and colic forms.

Small intestine alone involved.	*Ileo-cæcal form and colic form.*
1. Little or no tenesmus.	1. Much tenesmus.
2. Much hæmorrhage by stool and vomit.	2. Simple blood-staining of motions.
3. Symptoms of obstruction very early.	3. Obstruction late or absent.
4. Tumour small and movable.	4. Tumour large, more fixed, easy to feel.
5. Invagination not felt per rectum.	5. Invagination often detected per rectum.

Sloughing and expulsion of the intussusception is most frequent when the small intestine alone is involved. Recovery too is far more frequent in that variety than in ileo-cæcal or colic intussusceptions.

Treatment.—This is *medical*, *mechanical*, and *operative*. The symptoms in many cases at the onset are too obscure to indicate with anything approaching certainty the lesion we have to encounter. Mucous discharges from the bowel, vomiting, tenesmus, and the escape of blood are not conclusive signs. Even diarrhœa and intestinal derangement, which more properly belong to an irritated rather than to a displaced intestine, may be present in cases of intussusception.

Whenever symptoms of obstruction of the bowels present themselves in a young child we should not overlook the possibility of intussusception. When the seizure is sudden, and displacement is considered no longer doubtful, we may adopt remedies with some chance of success. If there be a tumour in the abdomen with localised tenderness, two or three leeches may be applied over the spot.

If there be no sickness at the beginning, and constipation be the chief feature of the complaint, a dose of castor oil may be necessary, and warm-water enemata; but if these should fail to move the bowels it is no longer advisable to continue them, but to substitute in their places remedies of a soothing and sedative character. The intestines may be kept at rest by opium in small and repeated doses, and fomentations to the abdomen may be used, or a warm bath. The opium will often allay the distressing sickness which is present, and iced water, ice to suck, or hydrocyanic acid, will all be useful. Sometimes a small mustard poultice to the pit of the stomach will stop the sickness.

The chief aim of the *medical* treatment consists in the most absolute repose, and the simplest diet, that the intestines may be kept free from commotion, and bulky matters, the refuse of digestion, may not enter them. Under this plan the bowels have, after many days, often gradually righted themselves.

The *mechanical* treatment consists in the forcible injection of copious enemata of warm water, soap-and-water, or thin gruel. This simple measure is often successful, for where the intussusception takes place between the ileum and cæcum (as it frequently does), the fluid may pass beyond the valve into the ileum, and overcome the resistance. Another plan is to pour warm water through a funnel at a varying height, according to the force required. A piece of india-rubber tubing, about two yards long, is attached by one extremity to the funnel, and by the other to a tube, which is inserted into the rectum. I have recorded a very interesting case, successfully treated in this manner.*

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* "Intestinal Obstruction in a Child: Treatment by Belladonna and Gradual Injec-

Inflation by means of air has been used successfully since the time of Hippocrates, and it is doubtful whether, in these modern times, it is practised as often as it ought to be; for when it has been employed in children, many cases are recorded where the resistance has been overcome. A pair of ordinary bellows may be used, the nozzle introduced into the rectum, and the inflation proceeded with till the obstruction yields. It is perhaps the better plan to attach a gum elastic enema tube to the bellows, and then insert it into the rectum. In some cases a hand spray may be used. Dr Frederick Taylor has recorded three cases in children treated by inflation; two were successful and the third died from exhaustion in forty-eight hours after the first symptoms. Inflation requires to be managed with care, lest injury to the bowel, or rupture of the peritoneum should result from the distending force.*

The *surgical* treatment consists in performing the operation of gastrotomy, when all other measures have proved unavailing. The circumstances of each particular case must be carefully weighed—the urgency of the symptoms, and the strength of the patient; the probability of inflammation, and the prospect of alighting on the seat of mischief. From what we have learned of late years respecting the tolerance of the peritoneum to local injury, and with what impunity it may be handled without exciting inflammation, there is reason to think that the lives of many children might have been saved if the operation had not been too long delayed.

Many writers, however, are of opinion that this treatment is attended with too much risk to justify the step, because there is difficulty in ascertaining the seat of obstruction, and even if found, the operation is attended with extreme danger. If a tumour can be felt in the left iliac fossa, where the intussusception frequently is located, there is a fair chance of localising the constriction, and the operator has not to search at all parts of the intestinal tube. Besides, the distance to which enemata travel may aid the diagnosis. It seems certain that if the operation holds out any chance of success, it should not be delayed over three or four days when the symptoms are severe; because the invaginated bowel may inflame, and contract adhesions with the surrounding parts.

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tion of warm water poured into the Rectum through a Funnel and India-rubber Tubing; recovery." By W. H. Day, M.D., 'Brit. Med. Journ.,' May 31, 1879.

* "Three Cases of Intussusception treated by Inflation," 'Clin. Trans.,' vol. xvi, p. 64.

"Only three cases collected by Haven, in which gastrotomy was performed, terminated favorably."*

The two following are examples of gastrotomy, one fatal, and one successful.

CASE 1.—Mr Hutchinson has described an interesting case of a child six months old on whom he operated. The child had been ill four days when he saw it, with painful straining and the passage of bloody mucus. The invaginated part could be easily felt in the left flank by manipulation through the abdominal wall, and also by the finger introduced into the rectum. (An infant sister died a year previously of the same lesion.) The intussusception had begun in the cæcum, and at the post-mortem next day there was universal peritonitis, and the cæcum was attached by a long mesentery. Mr Hutchinson considered that the cæcum had been loose congenitally.†

CASE 2.—Mr Howard Marsh‡ has described an interesting and successful case of gastrotomy. The child (a male infant seven months old) was seized, fourteen days before he saw him, with diarrhœa, sickness, and occasional griping pains in the abdomen. The case was considered by the medical attendants, Dr Miller and Dr Barnes, of Eye, in Suffolk, to be due to catarrhal enteritis, and natural evacuations followed small doses of castor-oil emulsion. In two or three days griping and sickness returned, and there were in addition tenesmus and a quantity of slimy mucus mixed with blood. The child remained in much the same condition till twelve hours before the consultation (April 11th, 1875), when the pain and tenesmus were violent, and he became pale and restless. On examination a firm cylindrical and sausage-shaped tumour was felt in the abdomen, "extending from the umbilicus to the left iliac fossa," and two inches of the bowel protruded from the anus, with the ileo-cæcal valve at the extremity. Insufflation and warm-water enemata failed to reduce the invagination. The child was placed under chloroform, and the abdomen having been opened, the entering portion of the gut was carefully pulled out, when it was found that the invaginated intestine "included at least half the colon and an equal portion of the small intestine." After the operation small doses of laudanum were given, and the child drank freely of milk and water. The sickness ceased at once, and two days after the operation a feculent motion was passed. The wound had nearly healed eighty-four hours after the operation, and a few days later the child recovered. Nine months after the child was in good health. This case is one which testifies to the importance of an operation when the symptoms are severe; and shows that the possibility of strangulation or inflammation being present, should not prevent the operation, when the case holds out no other hope of success. In cases which appear most formidable before the operation, the invagination having been restored, improvement may at once set in, proving that the circulation through the bowel has not been interfered with.

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* Meigs and Pepper, op. cit., p. 477.

† 'Med.-Chir. Trans.,' vol. lix, 1876, p. 100, "Abdominal Section for Intussusception into Colon."

‡ Ibid., p. 81, "A Case in which Abdominal Section was successfully performed for Intussusception in an Infant seven months old."

CHAPTER XIX

DISEASES OF THE LIVER

CONGESTION OF THE LIVER—*Nature—Causes—Symptoms and treatment.*—CIRRHOSIS—*Two forms*—1. *Atrophic*—2. *Hypertrophic.—Symptoms—Causes—Diagnosis—Morbid anatomy —Treatment.*—SYPHILITIC DISEASE OF THE LIVER.

CONGESTION of the liver is not unfrequent in children. It is manifested by constipated bowels and clay-coloured evacuations; the appetite is poor, the complexion sallow, and the tongue coated; the conjunctivæ have a yellowish tint, and the urine is high coloured and turbid on standing. There is a sense of weight and fulness about the region of the liver, and its edge may sometimes be felt below the ribs on the right side. This is a state of *active* congestion.

It should be remarked that in making an examination of the liver we shall find it proportionately larger in early life than in adult life, and that what would be considered an enlarged area of hepatic dulness in the latter would not necessarily be so in the former.

The liver varies in health as to size, and there is more blood in it at one time than at another. It is larger before puberty than afterwards. It is also influenced by diet being temporarily increased after a meal, particularly if the food has been fatty, saccharine, or containing alcoholic ingredients.*

The pathology or nature of the change consists in a uniform enlargement of the liver, which is also darker in colour, from containing more blood than it does normally. The congestion may affect chiefly the hepatic or portal vein; the lobules have in the first case a light border, and in the second a dark border. The congestion, therefore, is spoken of as intralobular and interlobular.

The *causes* are overfeeding and inattention to the rules of health. Rich and stimulating food in large quantities, especially if children are confined in-doors, and do not get sufficient exercise; or cold after a heavy meal may induce it. Organic disease of the valves of the heart, as mitral regurgitation, and more or less distension of the right cavities, will, by inducing a mechanical obstacle to the return of blood through the veins, set up *passive* congestion. Under these circumstances the liver is habitually congested, and it grows larger, at least for a time. "The pressure exerted by the constantly distended hepatic veins causes atrophy of the central portions of the lobules, and induces a form of granular liver, different from true cirrhosis, where the atrophy commences at the circumference of the lobules."* An enlarged liver may sometimes occur in connection with chronic disease of the lungs. In two cases of emphysema of the lungs, in children under my care, the liver was enlarged in both; it may be present in ascites, and sometimes produces it; it occurs in mesenteric disease, and in rickety subjects, where the head is large, the teeth decayed, and the limbs small.

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* 'Lectures on Diseases of the Liver,' by Dr Murchison, 1877, p. 131.

The *symptoms* are a dragging pain or tightness below the right ribs, but, as some children will bear pressure without complaining, the physical signs denoting enlargement of the liver are mostly to be relied on for diagnosis. In a large number of cases pain is altogether absent. There is now and then some degree of jaundice present, but this is more often seen in adults than in children; the liver may be felt an inch below the ribs, and the motions may be deficient in bile when the skin is perfectly clear. Simple congestion of the liver, therefore, in children is not usually attended with jaundice. The urine is scanty, and on standing may throw down copious urates, though it is sometimes perfectly clear and natural. The general signs are headache, nausea, loss of appetite, furred tongue, flatulence, and even vomiting. There may be diarrhœa and irritation of the bowels, languor and drowsiness. The liver may remain large after jaundice for a long time, and pain of a dragging character ensue, with dyspeptic symptoms, headache, and lassitude. As the circulation is relieved and the turgid capillaries are unloaded, the jaundiced hue, which is not necessarily present, passes off.

Treatment.—We must first aim at the removal of the cause. When congestion of the liver happens to young children from overfeeding and inattention to the rules of health, care and attention to diet will soon cure the complaint. In the shape of medicine a mild mercurial, followed by a saline aperient, will excite a watery discharge from the mucous membrane of the bowels, and bring away some bilious motions. A warm bath at bedtime for a few nights is an admirable remedy, and if there is pain or weight over the region of the liver, a hot poultice will be beneficial. The perchloride of mercury with tincture of bark is often useful, and the nitro-hydrochloride acid and taraxacum (Form. 42) where there is debility and dislike to food. When the congestion is due to disease of the thoracic viscera an occasional calomel purge, followed by a saline aperient is equally available, and the diet will require to be regulated. A small dose of calomel stimulates the upper bowel and duodenum, and drives the bile along the intestines. Small doses of ipecacuanha are also useful by increasing the action of the liver and skin.

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* 'Lectures on Diseases of the Liver,' by Dr Murchison, 1877, p. 182.

When children are sleepless and irritable, bromide of potassium is useful if the liver is congested, and the urine high coloured and scanty. In similar cases, the chloride of ammonium, which acts on the skin and kidneys, is an excellent remedy, though rather too nauseous for children.

Later on, when the urine is clear, and there is debility, the syrup of the iodide of iron, nux vomica, or arsenic, are suitable remedies.

Cirrhosis.—Two forms of this disease have been described. 1. ATROPHIC OR COMMON CIRRHOSIS. 2. HYPERTROPHIC CIRRHOSIS.

1. *Atrophic cirrhosis.*—In this disease the liver is at first increased in size, in consequence of an infiltration of small round cells into the areolar tissue of the portal canals, and the increase of the organ depends upon the extent of the cell proliferation. After a time, as this cellular tissue fibrillates and contracts, the liver diminishes in size, the portal veins are compressed, and the passage of blood is impeded; the vascularity of the liver is lessened, indeed, some of the branches of the portal vein are entirely obliterated, hence atrophy and shrinking of portions of the liver. The small ducts undergo compression in the same way as the branches of the portal vein. Wilks and Moxon consider that in many cases there is no proof of lymph being thrown out, as in active inflammation, and that the whole change is chronic.*

Causes.—Spirit drinking is the most common cause of cirrhosis in the adult. This is one reason why the disease is only exceptionally met with in children. When taken up by the blood vessels of the stomach, alcohol is at once conveyed to the liver. Typical cases of the disease were met with in two sisters, aged eleven and twelve years, who were both of them great "Schnapps-drinkers."[*]

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* 'Pathological Anatomy,' 1875, p. 447.

Dr Murchison relates a case in a boy, nine years of age, who drank "a good deal of wine and water between meals." Paracentesis was twice performed. He died from prostration and collapse. After death the liver was found tough and hobnailed, and weighed (21½ oz.)[†] The same writer relates a case of interstitial hepatitis in a child twelve years of age, coming on from a chill, and ending in cirrhotic contraction and death. The disease set in slowly, followed by severe abdominal pain and deep jaundice, the liver extended nearly to the pubes, and the spleen was enlarged. Death was preceded by diarrhœa, with hæmorrhage, offensive breath, rapid pulse, fever, delirium, irregular breathing and coma. A post-mortem examination revealed a small rounded liver (16 oz.), the tissue being firm, and the surface irregular and puckered; capsule thickened; spleen enlarged.[‡]

An interesting case of cirrhosis in a child is recorded by Dr Arthur Fox, accompanied with jaundice, hæmatemesis and coma. After death the liver was found unusually large, the capsule thickened and the surface finely granular. "The glands in the portal fissure were much enlarged and deeply pigmented. The spleen was enormously gorged with blood, and somewhat friable." The kidneys were congested, but otherwise normal. The intense jaundice was attributed to the pressure of the enlarged glands on the bile-duct. There was no history of hereditary syphilis, but his mother had been a chronic drinker for years. Dr Fox considers that cirrhosis in children may be one of the consequences of alcoholic heredity; though it may occur independent of it as a grave general disease.[§] Cirrhosis in children is considered to be a common result of congenital syphilis.

According to Dr Budd, the small miliary tubercles found in the liver of persons dying of phthisis never cause adhesive inflammation of the organ, which, as he says, is remarkable, seeing the tendency they have to set up inflammation in the different tissues of the lung.*

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[*] Niemeyer, 'Practical Medicine,' 1875, vol. i, p. 643.

[†] 'Lectures on Diseases of the Liver,' 1877, p. 302.

[‡] Ibid., p. 632.

[§] 'Brit. Med. Journ.,' 1878, vol. ii, p. 913.

Diagnosis.—This is not very easy in children who exceptionally indulge in alcohol. A sallow hue of the skin, or even jaundice; thirst, dry tongue, furred or reddish; scanty and high-coloured urine; costive bowels, with a deficiency of bile in the motions; pain in the hepatic region, and tenderness on pressure are to be looked for. Ascites is often present to a considerable degree. There is sometimes epistaxis, or hæmorrhage from the bowels. Dr Wickham Legg records two cases in children, aged respectively seventeen months and twelve years, in which no special attention was given to the liver during life. In the first case, purging took place during the last few weeks of life, and a few days before death, tubercular meningitis was diagnosed and appeared to end as such; in the second case, the symptoms resembled typhoid fever in the early stage, and later on acute tuberculosis. The temperature at one time reached 104·5°, there was delirium, flushed face, and sordes on the teeth. The liver weighed 39 oz.†

Morbid anatomy.—The liver is much reduced in size, and of a yellowish colour, resembling beeswax. Fibrous tissue of a tough character is diffused through the organ and around the vessels. As it contracts, the parenchyma is squeezed into a coarse nodular appearance, the capsule is thickened, the walls of the portal vein are also thickened, and its calibre is diminished. The hepatic cells are destroyed, or in a state of fatty degeneration. Owing to the occasional extension of the morbid process from the liver to the serous cavities of the pleura and pericardium, cirrhosis has been looked upon not altogether as a local disease of the liver, but as a grave general disease of the lymphatic system.‡

2. *Hypertrophic cirrhosis.*—This is a special affection of the liver presenting characteristic anatomical appearances. It has a different pathology from the hobnailed liver, and does not appear to have any connection with the consumption of alcohol. A new growth of connective tissue takes place round each lobule, and in the course of the bile-ducts. The liver is enlarged to two or three times its natural size, smooth on its surface, and of normal shape. The anterior edge is well defined. In some parts the natural

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* 'Diseases of the Liver,' 1852, p. 129.

† 'St. Bart. Hosp. Rep.,' vol. xiii, p. 154.

‡ Report by Dr Burdon Sanderson on Dr Hillier's case of Ascites, 'Clin. Trans.,' vol. i, p. 117.

hepatic tissue predominates, and in others it has disappeared. Under the microscope the fibroid growth shows the same appearances as those of ordinary cirrhosis. The obstruction caused by the disease is chiefly in the ducts, and not necessarily in the portal circulation. Dr Samuel West has recorded an interesting case of this disease in a child, two years of age, which appeared to follow a severe scald of the whole abdomen and right extremity, about two months before admission into hospital. The symptoms were increasing jaundice, enlarged liver, relaxed bowels, greedy appetite, screaming, vomiting of dark-coloured fluid, convulsions, coma and death. The highest temperature was 99·8°, and the highest pulse 120, which fell to 64 a short time before death. The urine contained bile pigments. During life the condition was thought to be one of acute yellow atrophy, which, as we have seen, is very rare in children. After death the liver was found to be small, watery in appearance, and stained with bile. The stomach contained some altered blood. There was no ulcer in the duodenum. The spleen, heart, and lungs were natural. Some of the bronchial glands were caseous.* The disease presents a striking contrast to ordinary cirrhosis. In the latter affection, jaundice is unusual; the liver, except at the earliest stage, is atrophied; ascites and dilatation of the abdominal veins are marked, and fever is absent. Moreover, death occurs from gradual exhaustion, ascites, hæmorrhage from the stomach or bowels, profuse diarrhœa, pneumonia, and not from the presence of bile in the blood producing delirium and convulsions, or from that state of the liver in which its cells have undergone atrophy or destruction, as is the case in the hypertrophic form.

Treatment.—Diet is important. It should consist of milk, eggs, white fish, farinaceous food and poultry. Alcohol should not be given in any form or shape. At an early stage, when the liver is congested and tender, the application of two or three leeches may be necessary, or a linseed poultice frequently renewed. Small doses of Hyd. c. Creta with rhubarb are serviceable, and a saline aperient to unload the portal circulation, and keep the bowels freely open, will relieve the symptoms greatly. If there is loss of appetite, the compound infusion of gentian, taraxacum, and dilute nitric acid may be given. Chloride of ammonium is sometimes useful. When ascites threatens, diuretics such as the acetate of potash in decoction of broom, should be tried, and if they fail, hydragogue purgatives, as the compound jalap powder, are indicated. When ascites is present to a degree which embarrasses the respiration and causes pain, recourse must be had to paracentesis. If there is a syphilitic history, mercury and iodide of potassium may be demanded.

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* 'St. Bart. Hosp. Rep.,' vol. xiii, p. 225.

Syphilitic disease of the liver is another form of hepatic enlargement. The lesions of this organ seen in hereditary syphilis usually consist in hardening and hypertrophy, so that it creaks as the knife passes through it. "On a uniform, yellowish ground, a more or less close layer of small white opaque grains is seen, having the appearance of grains of semola, with some delicate arborescences, formed of empty blood-vessels. On pressure no blood is forced out, but only a slightly yellow serum, which is derived from the albumen."[*] The change may be limited to the right or the left lobe of the liver. The capillary vessels are obliterated, and the dimensions of the larger vessels reduced. The microscope shows the morbid appearances to be due to the presence of a fibro-plastic material. These changes may be developed during intra-uterine life. The symptoms are not very definite; there may be vomiting, diarrhœa, or constipation, but never any jaundice. Death takes place early. Fatal peritonitis, it has been said, may be the consequence of the hepatitis being followed by the extension of inflammation from the peritoneal covering of the liver.

There is a case recorded by Dr Goodhart,[†] in which the liver and spleen were very large in an infant two months old. The evidence of congenital syphilis was doubtful, but a cure was effected by one grain of grey powder, given night and morning, followed by the syrup of the iodide of iron.

Frerichs speaks of three forms of syphilitic disease of the liver:—1. Simple interstitial hepatitis; 2. Hepatitis gummosa; 3. Waxy amyloid or lardaceous degeneration of the liver. All three forms may be found in the same liver, or may exist independently.[‡]

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[*] Diday on 'Infantile Syphilis,' New Syd. Soc., 1859, p. 92.

[†] Enlargement of the liver and spleen; the hepatic swelling quickly subsiding under medical treatment.—'Brit. Med. Journ.,' vol. ii, 1878, p. 438.

[‡] 'Diseases of the Liver,' New Syd. Soc. Transl., 1861, vol. ii, p. 152.

CHAPTER XX

ICTERUS OR JAUNDICE

DEFINITION AND SYMPTOMS—*Causes—Cold and bad atmosphere—The entrance of bile into the blood from distension of the bile-ducts, and retention of bile within the liver—Fæcal accumulation pressing on the liver—Treatment.*—ICTERUS NEONATORUM—ACUTE YELLOW ATROPHY OF THE LIVER.

BY the term jaundice we understand a yellowish colour of the integument, caused by the entrance of bile into the blood; this, with yellow conjunctivæ and urine, and the whitish or pipeclay appearance of the fæces, distinguish it from every other disease.

The *symptoms* of jaundice in children often commence with sickness and vomiting of food; there may be severe frontal headache, languor and lassitude; the child can make no exertion to do anything; there is loss of appetite, and sometimes pain over the region of the liver, though this may be absent even when the organ is considerably enlarged. Pain, indeed, is a rare symptom in the jaundice of children, and when present in the jaundice of adults, it probably indicates distension of the bile-ducts from the passage of a gall-stone. The surface of the body and conjunctivæ generally assume a yellow appearance, and the extremities are sometimes much more affected than the back. The temperature is normal, and the pulse slow, except there is acute pain over the liver from the amount of congestion present, and then there is dryness of the skin and febrile disturbance.

The urine is generally of a dark Madeira colour, from the admixture of bile, and it stains linen yellow. Casts of the urinary tubules have been observed in it. In very severe cases the sweat and saliva are also yellow, and objects appear yellow to the eye. The bowels are usually constipated, and the motions pale like pipe-clay. Sometimes there is diarrhœa, and the stools are colourless, if the bile-duct is completely obstructed. In cases where the constitution is bad, petechiæ may appear on the skin, and there may even be hæmorrhage from the mucous surfaces. According to Wickham Legg, the tint of jaundice has been observed by several authorities in the mouth before it has been apparent elsewhere.*

Causes.—Jaundice results in infants and very young children from a bad atmosphere and cold, so that the skin and organs of respiration do not perfectly perform their functions. The disease is most common in the feeble and delicate. As the skin takes on its proper functions, and cold is guarded against, the jaundice disappears in a few days, provided nothing is given in the shape of food except breast milk.

Jaundice may, however, arise from enlargement and inflammation of the liver or umbilical veins, or from obstruction or inflammation of the bile-ducts, or even absence of the gall-bladder. It has been attributed to spasmodic closure of the ducts, but whether this can produce it or not, we know that the essential or true cause is a retention of the bile within the liver, and the transudation of the bile through the capillaries and bile-ducts into the circulating blood. Jaundice may arise from congestion of the liver; the secretion of bile is diminished because the gorged state of the blood-vessels presses upon the gall-ducts, and does not allow the bile to pass freely through them. The liver is enlarged, and of a deep red colour in the central parts, whilst the margins are pale.

Jaundice in older children, as in adults, is most common in summer and autumn, and in some cases is accompanied with diarrhœa. Nausea and sickness, headache, loss of appetite, drowsiness, and restless nights are common symptoms. I attended a severe case of jaundice in a young lad some years ago, which came on after excitement and running some distance immediately after a heavy meal.

Jaundice has arisen from round worms entering the orifice of the bile-duct, and causing biliary colic, vomiting, and all the symptoms of gall-stones.† A similar case is also on record.‡ Dr Budd mentions the fact that several cases of jaundice, in quick succession, have come to his knowledge in children of the same family, or in several persons living in the same locality. He attributes it to some poison (probably miasm) which arrests the secretion of the liver owing to some change in the blood.[*] Probably the liver was imperfectly developed. Some persons have small livers, just as others have small hearts.

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* 'St Bart. Hosp. Rep.,' vol. xiii, p. 12.

† Murchison, op. cit., p. 345.

‡ 'Brit. Med. Journ.,' vol. ii, 1878, p. 877.

The diagnosis from cerebral disease consists in the absence of febrile disturbance, no heat of head, or intolerance of light, the vomiting is less, and the pulse is slow rather than frequent. There is often tenderness over the region of the liver, the motions are pale, and the urine is high coloured.

The *treatment* of jaundice is that of biliary congestion. If there is pain or great tenderness over the liver a leech or two may be applied there, or at the anus, followed by a warm linseed poultice. Two grains of Hyd. c. Creta, or even a grain of calomel, should be given at bedtime to a child seven or eight years old, followed by sulphate of magnesia during the day, or the nitro-muriatic acid mixture, with taraxacum (Form. 42). It is important to keep the bowels open, and to give a farinaceous diet chiefly. Milk in soda water is nutritious and refreshing. If there is thirst, barley water, with a little cream of tartar in it, will be useful. Bicarbonate of soda and tartaric acid given in full doses whilst effervescing will relieve sickness and keep up a gentle action of the bowels. If the liver remains sluggish and painful, a lotion of nitric acid applied at bedtime under oiled silk is a good application. It causes redness and tingling of the skin, and when this happens it should be omitted till the erythema has passed away, before it is re-applied.[†] Emetics repeated daily are in favour with some practitioners, especially when the jaundice is due to catarrh of the bile-ducts.

Icterus neonatorum is not a disease of the liver, as its name seems to imply, but is merely caused by the changes in the colour of the skin during the first few days of life. In infants after birth the skin is much congested; this gradually declines till a rosy tint is reached in the course of a few days. It sometimes happens in children, otherwise well, that the skin, after the first two or three days of life, assumes a yellowish orange tint, which popularly goes by the name of jaundice, the urine and motions being in all respects natural. The complaint is caused by the blood in the skin changing into a yellowish tint before the normal colour is reached. The conjunctivæ in these cases remain clear, and the urine contains no trace of bile-pigment. The disorder is, therefore, in most cases, a mere cutaneous discoloration.

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[*] 'Diseases of the Liver,' 1852, p. 273.

[†] Form. 44:
℞ Acid. Nit. Dil. ʒj
Aquam Rosæ ad ℥xx.
Fiat Lotio.

This simple form of icterus has been shown to be frequently due to deficient oxygenation of the blood, but "*icterus neonatorum*" may also represent a very grave condition, viz. obstruction of the bile-duct* from congenital stricture, or from inspissated bile, or the jaundice may have a pyæmic origin from phlebitis of the umbilical vein, as Dr Murchison has shown (op. cit., p. 347).

A male infant, seven weeks old, was sent to me by Mr Butler, of Guildford, on April 8th, 1879, suffering from severe jaundice. On the third day after birth, he became very yellow, but took Swiss milk well and was also suckled by a wet nurse. The child was well nourished, and had not wasted, though the mother said he seemed less plump than at birth. The colour of the integument was of a deep yellow on the face and thorax, and of a lighter hue below the umbilicus, scrotum, and buttocks. The conjunctivæ presented a yellowish-green tint, varying from time to time in intensity. Both the liver and spleen were enlarged. There was a good deal of tympanites, but the child could retain his food; there was no vomiting, the fæces were relaxed, and although nearly always clay coloured, a trace of bile had been seen in the motions; the urine was of a pale saffron colour. The history of the case favoured the supposition that the jaundice might be caused by absence, obstruction, or malformation of the gall-bladder or bile-ducts. He was ordered to be fed on milk and lime water, and as the diagnosis could at best be only doubtful, a powder consisting of a grain of Hydr. cum Creta and bicarbonate of soda, was ordered, occasionally at bedtime, and a mixture containing the solution of carbonate of magnesia and taraxacum during the day.

Mr Butler informed me, six months later, that the child had died, and a post-mortem examination had been made by Mr Bisshopp, of Tunbridge Wells, on August 23, 1879. A good deal of ascitic fluid was found in the abdominal cavity of a deep yellow colour, which appeared due, not to any inflammation of the peritoneum itself, but to the dense, hard contracted state of the liver, from chronic inflammatory changes, which had obstructed the hepatic circulation precisely in the manner seen in cirrhosis. The gall-bladder contained a glairy white fluid, but no bile. The hepatic, cystic, and common bile-ducts were all absent. The anatomical malformation had caused the incurable jaundice, the chronic inflammation of the liver and dropsy, and finally the general wasting and death.

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* Mr Glaister has described a most interesting case of fatal "*icterus neonatorum*," where the common bile-duct was found to be constricted "a few lines from its duodenal insertion," and the left hepatic duct "seemed to split up into fibrous threads." The mother had borne several children before, six of whom had shown similar symptoms, four out of these six cases ending fatally. Both parents were troubled with frequent hepatic symptoms.—*Lancet*, vol. i, 1879, pp. 293, 330.

ACUTE YELLOW ATROPHY OF THE LIVER (SUPPRESSED SECRETION OF BILE—FATAL JAUNDICE) has been met with in children, but it is very rare. This form of jaundice, ending in coma, occurred to four members of the same family; two of these were brothers, of the respective ages of 11 and 13, and they both died.* A case is related by Dr Wickham Legg in a girl, 10 years of age. The whole integument was excessively jaundiced; there was incessant vomiting of semi-bilious and bloody fluid, delirium and death on the day following admission into hospital. After death the liver was found flaccid and felt doughy. The natural colour was broken by islets of a bright yellow colour the size of sixpence, continued into the substance of the liver. On a microscopical examination, no trace of liver cells could be found, the section showed an extremely dark and granular appearance with large and small granules of fat.†

Some authorities look upon this disease as nothing more than an early stage of cirrhosis, in which the connective tissue of the liver is increased.‡ Dr. Wilks has seen it in constitutional syphilis.§

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* Budd, op. cit., 269.

† 'St. Bart. Hosp. Rep.,' vol. vii, p. 211.

‡ Ibid., vol. xiii, p. 159.

§ 'Path. Trans.,' 1876, p. 375.

CHAPTER XXI

PAINLESS ENLARGEMENTS OF THE LIVER

HYDATIDS OF THE LIVER—*Pathology—Symptoms—Causes—Diagnosis—Termination and treatment.*—LARDACEOUS OR AMYLOID DISEASE.—FATTY LIVER.

HYDATID tumours of the liver are most common during the middle period of life, and are rarely found in childhood or old age. I have seen a large hydatid cyst extending downwards to the umbilicus, and across to the splenic region, in a girl eight years of age; and cases are recorded of its occurrence in children considerably younger. A membranous sac or cyst forms in the liver containing a colourless limpid fluid like water. In the fluid a variable number of cysts or bladders (acephalocysts) are found varying in size from a millet seed to a goose's egg. Hundreds or even thousands of these acephalocysts may be detected in a single parent cyst, to the walls of which the scolices of the echinococcus adhere. The sac or cyst is formed by the tissue of the liver, and is of variable thickness, being thicker in tumours of old than of recent standing.

Hydatid tumours grow very slowly, and are generally painless, at least when of small size, and they are rarely accompanied by dropsy or jaundice. This latter symptom will depend upon whether the common bile-duct undergoes compression from being surrounded by enlarged lymphatic glands, or is otherwise obstructed by some swelling of the liver, when there may be continued or remittent jaundice.[*] A case is also recorded by Dr Cayley, in which a patient had repeated attacks of hepatic pain with jaundice. The hydatids came away per anum, and the health remained good.[†] Hydatid tumours may be large enough to fill the greater part of the abdominal cavity, or to reach upwards into the chest nearly to the clavicle; they may not exceed the size of an orange, and when deeply seated they may escape observation altogether.* When they can be felt they are perfectly smooth, and they have an elastic or fluctuating feel. Occasionally the so-called hydatid fremitus may be detected. If there are several cysts, the surface of the liver may be irregular or lobulated.

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[*] 'Path. Trans.,' vol. xxv, p. 156.

[†] Path Soc., Oct. 20, 1874.

Ascites is an occasional consequence of pressure and interference with the circulation through the liver, but a case is on record where the portal fissure was much pressed upon without producing this result.† In some cases there is œdema of the lower limbs from pressure on the vena cava, and albumen has been detected in the urine from the tumour compressing the renal vein. In very exceptional instances, secondary hydatid cysts have been found in the spleen and kidney.

Causes.—The adult tænia echinococcus inhabits the intestines of the dog; the ova are voided in the fæces of the animal, and being swallowed with the food and drink, find their way to the liver, lung, or some other organ, and there become encysted.

Diagnosis.—When a tumour occupying the region of the liver is smooth and globular, and there is fluctuation with an absence of pain, fever, and jaundice, and the general health moreover remains good, we should suspect the existence of echinococci. The possibility of abscess or ovarian cyst, and especially pleuritic effusion, should be remembered, but these conditions could scarcely be confounded with a hydatid cyst, if care be taken before coming to a conclusion.

Termination.—The contents of a hydatid tumour may ultimately dry up, and the sac become obliterated, or it may burst spontaneously through the walls of the abdomen, or into the bronchi, intestine, or stomach, and the patient recover. The cyst may suppurate and induce pyæmia and gangrenous abscess of the liver, or it may burst into the pleura and produce fatal empyema.‡ When it bursts into the lung, the patient spits up a hydatid from time to time, and as the disease proceeds and the orifice in the pulmonary tissue becomes larger, several hydatids may be coughed up at one time. The symptoms attending this pulmonary complication are frequent straining cough, constant expectoration of a sanguineous or purulent character, and a disgusting taste in the mouth from the admixture of bile.[*] The most dangerous consequence is the liability of the sac under gradual growth and distension to ulcerate and rupture into the peritoneum, and there set up fatal inflammation. The tumour, too, may continue to increase in size, causing such compression of the hepatic structure, and disturbing the functions of adjacent organs by its growth, till it wears the child out by pain and exhaustion.

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* 'Diseases of the Liver,' by C. Murchison, M.D., 1877, p. 55.

† 'Clin. Trans.,' 1878, p. 236.

‡ Murchison, op. cit., p. 120—123.

Treatment.—Up to the present time drugs have proved useless. When the tumour is large it should be tapped with a fine exploratory trochar, or aspirator, and the fluid drawn off. The withdrawal of a small quantity of fluid by the hypodermic syringe, as a means of diagnosis, has been sometimes followed by complete atrophy of the cyst. The cases most likely to end in cure are those which have a thin cyst wall, and where the vesicles are few in number, or the acephalocyst is solitary. Several successful cases are related by Budd,[†] and Dr Murchison[‡] gives a table of eighty cases in which a cure followed the operation of puncture. Moreover, inflammation and suppuration may be set up in the sac by puncture, and recovery even then may ensue; or the hydatid may slowly exhaust the patient's strength, as we sometimes see in opening a large chronic abscess. Mr Teale has related a successful case of suppurating hydatid of the liver in a boy, aged 14, treated by direct incision and drainage after aspiration on four separate occasions. After emptying the tumour and evacuating its contents, the wall of the lower part of the cavity was stitched to the wall of the abdomen. A drainage-tube was inserted, and antiseptic dressings were applied.[§] Even the simple process of puncture is not free from danger, as there is a risk of the irritating fluid escaping into the abdominal cavity and provoking inflammation. Several fatal cases are recorded from puncture, death occurring in a few hours, faintness, rigors, vomiting of bilious matter, pain in the abdomen, and coldness of the extremities preceding death. Sometimes peritonitis has ensued, followed by a slow recovery.[||] A case is related by Mr Bryant, where agonising pain, lividity, unconsciousness, and sudden death followed the tapping of a hydatid cyst, and the result of the post-mortem examination seemed to show that the portal vein had been transfixed by the trochar, and that the hydatid fluid being sucked into it acted as a fatal poison.[*]

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[*] Budd, op. cit., p. 444.

[†] Op. cit., p. 448.

[‡] Murchison, 'Clinical Lectures on Diseases of the Liver,' 1877, p. 77.

[§] 'Brit. Med. Journ.,' vol. i, 1883, p. 208.

[||] Frerichs on 'Diseases of the Liver,' New Syd. Soc., vol. ii, p. 251.

Injections into the cyst have been tried, those containing iodine or carbolic acid being generally selected. Iodide of potassium given internally, and iodine ointment rubbed in over the enlarged liver, have severally been employed without success.

Chloroform should not be employed in the aspiration, as sickness is prone to follow the operation, and this is the more distressing when an anæsthetic is used.

Dr Hilton Fagge, carrying out the suggestion of Dr Althaus,[†] has recorded 8 cases of hydatid tumours of the liver treated by electrolysis. In 7 of the cases the cure was complete, in 1 only did any doubt remain as to cure, and in this no bad effects followed the operation. The respective ages of the children were 7, 13, 4, 7, 9, and 5¾ years. The operations were performed under chloroform. Two electrolytic needles were introduced into the cyst, one or two inches apart, and these were then attached to two metallic wires both connected with the negative pole of a galvanic battery of ten cells. A moistened sponge formed the termination of the positive pole, and this was placed on the skin, a little distance from the points of entrance of the needles. Its position was occasionally changed during the operation. The current was allowed to pass from ten to twenty minutes, and then the needles were withdrawn, and the seats of puncture covered with adhesive plaster. The effects of the operation varied in different cases. In most instances there was febrile disturbance, the temperature rising "to 99·5°, 101°, or even 102·6°." These symptoms generally subsided on the third or fourth day. The operation appears to be free from danger and not liable to excite suppuration within the cyst.[‡]

LARDACEOUS OR AMYLOID DISEASE OF THE LIVER—SCROFULOUS ENLARGEMENT OF THE LIVER (Budd)—ALBUMINOID ENLARGEMENT.—This disease is associated with weak and cachectic constitutions, and is not uncommon in rickety children. In this peculiar degeneration of the liver, waxy and fatty matter are infiltrated throughout it, and in many instances a similar extension of the disorder can be traced into the different tissues, as the lymphatic glands, blood-vessels, spleen, and renal organs.

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[*] 'Clin. Trans.,' 1878, p. 236.

[†] 'On the Electrolytic Treatment of Tumours, and other Surgical Diseases,' 1867.

[‡] 'Med. Chir. Trans.,' vol. liv, p. 1.

Pathology.—The liver is greatly enlarged and thickened; it may be somewhat paler than usual from a deficiency of blood, or at other times scarcely altered from its normal appearance. In some cases it presents a white appearance on section, and the lobules are either obliterated altogether, or they are scarcely to be distinguished. This "waxy" or albuminous matter never becomes hard, or shows any tendency to contract like lymph, which is the product of inflammation: it is destitute of cells or organisation. The surface of the liver is smooth, white and glistening, even when the disease is of long standing. The lobules become of a faint reddish colour and enlarged, the gland structure is uniform and smooth, and on section resembles "smoked salmon." This peculiar deposit may occur in isolated portions of the liver, or it may be scattered throughout the entire organ. It is first deposited within the lobules, and between the secreting cells, which are diminished in number. A similar condition of the spleen often accompanies this degeneration. Microscopically, oil-globules can be seen in abundance when the fatty matter is examined, but the great increase in the size of the liver is owing to the infiltration of this peculiar morbid matter stretching the capsule and obliterating the appearance of the lobules.

Causes.—Syphilis and scrofulous disease of the bones, especially when accompanied by chronic suppuration, are its usual causal relations. Caries of long standing appears to be a common cause. Out of eighty-three cases of lardaceous disease, seventy-three were in connection with either suppuration or syphilis, leaving but ten cases which were not ostensibly accounted for by these agents.*

The *general* symptoms are those of anæmia, gradual wasting and cachexia. The disease comes on so slowly that if it were not for the increased size of the abdomen, no notice would be taken of it. After a time there is languor and loss of appetite, gastro-intestinal derangement, and pale stools. Fever of an irregular type is common, attended with cough, dyspnœa, and quick pulse; the urine is often of low specific gravity from the presence of albumen, which is a consequence of the kidneys participating in the waxy degeneration. Waxy casts in the urine are a guide to diagnosis.

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* "Discussion on Lardaceous Disease," 'Path. Soc.,' March 18, 1879.

The disease may terminate in peritonitis, pneumonia, or tubercular disease of the lungs; but more frequently it ends in exhaustion, ascites, or general anasarca.

Enlargement of the submaxillary and cervical glands is frequently met with. In the case of a boy, aged 8, who died from the disease, the bronchial and mesenteric glands were found enlarged, "and filled with a substance like plaster."* In another case, of a boy, aged 11, there was a chain of enlarged glands extending from the bifurcation of the trachea to the diaphragm, some containing pus, and others calcareous particles.†

There is little to be hoped from treatment beyond attention to the general health, warm clothing, nourishing diet, chloride of ammonium, preparations of iron, cod-liver oil, and pure air.

Fatty liver.—This form of enlarged liver arises from the accumulation of oil within its substance. The organ increases uniformly in size in every direction; it is smooth on its surface, of doughy consistence, and after death, it is found to be pale in colour. No matter how severe the disease may be, the secretion of bile is not interfered with, therefore jaundice, in uncomplicated cases, does not occur; the superficial veins of the abdomen are not enlarged, and there is no ascites.

Symptoms.—These are anæmia and debility, languor, lassitude, flatulence, irregular bowels, and depression of spirits. The skin has a sallow or waxy appearance, resembling fine polished ivory, or a common wax model. Most of the constitutional symptoms are attributable to fatty degeneration of other organs, and more especially of the heart.‡

The spleen is rarely enlarged, and the complaint appears to arise chiefly in connection with phthisis, or some other wasting disorder.

Treatment.—This consists in attention to the digestive organs by alkalies, vegetable bitters, and aperients. The waters of Ems, Vichy, and Scwalbach are to be recommended. When anæmia is the leading feature, the preparations of iron, especially the ferri et ammoniæ citras will be found serviceable. The treatment, however, resolves itself into that which the primary affection requires.

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* Budd on the Liver, 1862, p. 304.

† Ibid., p. 305.

‡ 'Diseases of the Liver,' by C. Murchison, M.D., 1877, p. 49.

CHAPTER XXII

DISEASES OF THE SPLEEN

SYMPTOMS—*Pain in left hypochondrium—Cough—Dyspnœa—Sallowness of complexion—Increased size of the abdomen—May lead to cirrhosis and enlarged superficial veins over abdomen.*—PATHOLOGY—CAUSES—*Ague—Typhoid fever—Diseases of liver—Obstructive disease of the heart—Emphysema of the lungs—Tuberculosis—Syphilis—Anæmia.*—DIAGNOSIS—*Generally easy on account of thinness of abdominal walls—Not to be mistaken for enlarged liver, kidney, or mesenteric glands.*—TREATMENT—*Attention to the general health—Fomentations—Poultices and leeches in the acute stage—Mild mercurials in syphilitic cases—Quinine and arsenic if traceable to ague—Chalybeates in anæmia.*

AFFECTIONS of the spleen in children have been in my own personal experience almost exclusively confined to the lower classes, and even among them they are not of frequent occurrence.[*] "We sometimes meet with splenic disease in children in this country, and more especially in dispensary and hospital practice, where poor and insufficient food, bad ventilation, and humid houses have exerted a predisposing effect."[†] They may be described as those of enlargement and hypertrophy, arising chiefly from congestion and inflammation.

The elastic structure of the spleen renders it susceptible of distension from slight causes, and hence any affection of the liver or arrested skin action may increase its bulk. If these disorders continue, the spleen becomes engorged with blood and enlargement follows.

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[*] "Of 60 cases of death returned as due to spleen diseases in England, among male subjects, which occurred in 1877, only 9 were under five years of age; and of 67 females, only 12 were under five years of age. Under fifteen years of age it is extremely rare. In London, in the year 1877, of 8 cases of death in males, 3 were under five years of age; and of 10 cases of females, 2 were under five years of age."—*Fortieth Annual Report of the Registrar-General*, pp. 152—158.

[†] 'Reynolds' System of Medicine,' vol. v, p. 178, Article, "Diseases of the Spleen," by J. R. Wardell, M.D., F.R.C.P.

There is no organ so variable in size and consistence as the spleen. It is much larger in young persons than in those advanced in life. In old age it may become so wasted as not to exceed two or three drachms in weight.[*]

In amyloid or lardaceous degeneration, the Malpighian corpuscles may alone be affected. The spleen is enlarged, and its density is increased. On section, clear wax-like little bodies, of variable size, having the appearance of boiled sago, are to be seen in these corpuscles, hence the disease is known as the "sago spleen," which is frequently met with in those children who die of phthisis. There is another variety of the amyloid spleen in which the pulp is chiefly involved. It appears to be an advanced condition of the former affection, the disease extending from the corpuscles to the pulpy parenchyma.[†]

The general symptoms are not well marked, but if the spleen has attained any considerable size, there is usually some amount of pain, or tenderness, or distension in the left hypochondriac region, or over the epigastrium, extending through to the back; and there may be cough or dyspnœa on lying down; but these are only occasional symptoms. The child is sallow and pale; the tongue is bloodless and clean; the pulse is weak and frequent, and there is loss of flesh and strength. The urine often contains urates, and the motions are offensive, deficient in bile, or they are loose and contain mucus. Sometimes the bowels are constipated. In some cases there is scarcely any inconvenience beyond that caused by the increased size of the abdomen from the splenic tumour, the appetite and digestion being excellent. In two cases that came under my notice, although the tumour reached below the umbilicus in one case, and nearly filled the abdomen in the other, there were no noticeable symptoms beyond the inconvenience of a bulky mass in the abdomen. The complexion was sallow in both cases, but there was no headache, no fever, no pain in the side, or shoulder, which is often mentioned by writers.[‡] In other instances pain is complained of on pressure over the splenic region; the child lies on the left side with its knees drawn up, and is restless and sleepless at night. As splenic disease progresses, and the blood becomes more impoverished, an anæmic bruit may be heard over the base of the heart. There may be swelling of the abdomen terminating in ascites; but this is very rare. When the spleen has attained a very large size, the superficial veins become distended, in consequence of an interference with the circulation through the deeper abdominal vessels. In very long-standing cases of splenic disease the patient becomes anæmic, from a deficiency of red corpuscles in the blood, and an excess of the white. In one disease of the spleen there is an excess of white corpuscles (leukæmia) over the red, as in disease of the lymphatic glands, and there is associated with it at the same time a new growth of lymphatic tissue in the spleen. Hence the tendency to pallor, to œdema of the limbs, to hæmorrhage from the gums or nasal passages, as the consequence of those changes in the circulating blood. Under a continuance of these symptoms the child sinks from exhaustion, or death is often due to diarrhœa.

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[*] 'Pathological Anatomy,' by Wilks and Moxon, 1875, p. 473.

[†] 'Pathology and Morbid Anatomy,' by T. H Green, M.D., 1871, p. 69.

[‡] "The shoulder-tip pain and the nerve tenderness in these diseases are owing, as I believe they are in liver diseases, to an extension of irritation or inflammation from the diseased organ along its pneumogastric twigs to the trunk of the par vagum. In a case

Pathology.—As we are unacquainted with the functions of the spleen, we are in doubt concerning the theory of the morbid changes to which it is liable. Its turgidity, probably, depends upon some relaxation of the vessels and tissues of which it is composed, as well as to a nerve paresis. The fact of the spleen having been removed from the body without impairing the rest of the functions would go far to substantiate the view that it has no influence upon the secretions of the stomach or pancreas.

Michael Foster observes that the spleen increases in size after a meal, reaching its maximum about five hours after food is taken. It remains swollen for some time before returning to its normal bulk.[*]

Causes.—Enlargement of the spleen is frequently due to ague, and hence mostly prevails in marshy districts along with intermittent fever. Louis, Murchison, Warburton Begbie, and many other observers, have noticed it diseased in typhoid fever. Disease of the liver, as cirrhosis, or whatever obstructs the circulation of

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in which the morbid state of the spleen has been intense, and continued for a time, this irritation or inflammation passes up the trunk of the nerve to the base, and even to the origin of the par vagum, and the two divisions of the spinal accessory, giving rise to pains there, and other disturbances."—*On the Symmetry of the Pancreas and Spleen*, by D. Embleton, M.D., 'Brit. Med. Journ.,' vol. ii, 1874, p. 371.

[*] 'A Text-Book of Physiology,' 1878, p. 346.

the spleen, may increase its bulk. It is said to be often greatly enlarged in European children who reside in the tropics.[*] This is most likely a state of mere hyperæmia, but long-continued congestion ultimately leads to enlargement and induration. Obstructive disease of the heart, emphysema of the lungs, by causing dilatation of the right cavities of the heart, and acute tuberculosis, may induce congestion of the spleen. In the latter affection, I have seen a few caseous deposits of considerable size, both in this organ and the liver, when the lungs have been studded with similar tubercles, and the diaphragm honeycombed. Tubercle is frequently met with in the spleens of children dying of acute general tuberculosis, either in the form of grey or yellow tubercles, or yellow caseous masses; they may be smaller than a pin's head, or larger than a pea. An enlarged spleen, associated with rickets, came under my care in April, 1880. in the case of a child a year old, the spleen reaching to the ileum below, and on its inner border to the umbilicus. Although mechanical congestion may be one cause of the hypertrophy it more frequently arises from some morbid condition of the blood, from endocarditis, given rise to infarctions,[†] from syphilis,[‡] from fevers,[§] from anæmia,[‖] but in many instances it undergoes enlargement without assignable cause. On section it is soft, vascular, and of a dark red colour. A healthy woman and her husband had six children, three of whom had disease of the spleen. One child, a boy, was noticed to have a large spleen when fifteen months old, and he lived to be nine years and a half old. Epistaxis began at the age of five years, and continued to recur periodically about once a month. A second child (whom I saw in August, 1880), ten years of age, bled from the nose in the same way, and quite as profusely.[¶] A third child, a girl one year old, had an enlarged spleen, extending to the ilium and umbilicus. It had only been detected five weeks. All these children were ravenous for food. The spleen has also been found hypertrophied in some cases of leucocythemia (*splenic leucocythæmia*), and in this affection it attains a great size. Dr Taylor has recorded the case of a boy, twelve years of age, who died from this disease, and whose spleen was found to weigh 51 ounces.*

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[*] 'Reynolds' System of Medicine,' Article, "Diseases of the Spleen," by J. R. Wardell, M.D., F.R.C.P., vol. v, p. 141.

[†] Vide Chap. XL, "Ulcerative Endocarditis."

[‡] Vide Chap. L, "On Syphilis."

[§] Vide Chap V, "On Fevers."

[‖] Vide Chap. LI, "On Anæmia."

[¶] "In nearly all affections of the spleen nasal hæmorrhage is a common symptom, and among ancient physicians, and to this day among the people, repeated bleeding of the nose, especially if from the left nostril, is taken for an almost pathognomonic symptom of such disease."—*Niemeyer's Text-book of Practical Medicine*, 1875, vol. i, p. 293

Diagnosis.—As the abdominal wall in children is not covered with much fat, and the muscles are thin, the diagnosis of enlarged spleen is far easier in them than in adults. Some care, however, is necessary not to mistake for an enlarged spleen an abdominal tumour caused by enlargement of the kidney, or liver, or by disease of the mesenteric glands. In forming an opinion of tumours in this situation, it is well to glance at the anatomical position of the spleen. It lies hidden in the left hypochondrium under cover of the ribs, between them and the stomach. When healthy it cannot be felt through the abdominal parietes; if it can, it is diseased. Moreover, it is influenced by the respiratory movements.

An enlarged spleen may extend inwards to the epigastrium and umbilicus. In some children it reaches down to the spine of the ilium. The tumour is smooth, elastic, and firm, and being situated just beneath the integument, its shape and firmness can generally be well ascertained. In cases of difficult diagnosis, the history of ague would be of much assistance. Sir W. Jenner has seen a tumour, supposed to be fæcal, which turned out to be a big spleen, and the child was purged till it had bloody stools.† Tumours which are due to enlargement of the kidney, do not cause any projection posteriorly; the expansion takes place in the direction in which they meet with the least resistance, and that is always in front.‡

Treatment.—The general health will require careful attention to maintain it at the best possible standard. In this we must be guided according to the circumstances and surroundings of each individual case, the strength of the child, the stage at which the disease has arrived, and the complications it may have produced. If inflammatory symptoms are present, and there is any degree of acute pain, thirst, dyspnœa, &c., poultices and fomentations, and even two or three leeches, applied over the affected part, may be necessary to reduce congestion of the gland. If the skin is hot and dry, and there is any degree of fever, saline aperients (Form. 8—41) to unload the bowels and drain the portal system will be needed. When all acute symptoms have departed, the use of iodine externally, in the shape of ointment (Ung. Iodi.), and the iodide of potassium internally may be demanded. Very frequently a cachectic state of the system exists, arising from ague, syphilis, or rickets, and these conditions must be met by suitable remedies, such as arsenic, mild mercurials, quinine, &c., continued for a long time. Mr Tyson, of Folkestone, has recorded a "Case of Syphilitic Enlarged Spleen in a Child." At two years of age, the spleen reached to the crest of the ileum, and nearly to the umbilicus. A grain of grey powder was given night and morning, and one grain of iodide of potassium with ten minims of the syrup of iodide of iron, three times a day. In three months, the spleen was smaller, and two months later, it only extended an inch below the margin of the ribs. The remedies were given for about a year when the spleen was imperceptible, and the child's health excellent.*

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* 'Path. Trans.,' vol. xxv, p. 253.

† "Clinical Lectures on the Diagnosis of Extra-pelvic Tumours of the Abdomen," 'Brit. Med. Journ.,' 1869, vol. ii, p. 43.

‡ See Chap. XXIII, "Hydronephrosis."

In a large number of cases, anæmia is so marked, and the constitution so reduced, that the patients lose flesh, and gradually sink away exhausted. Chalybeates are of course indicated.

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* 'The Lancet,' 1880, vol. ii, p. 653.

CHAPTER XXIII

DISEASES OF THE KIDNEYS AND URINARY ORGANS

Theories of the urinary secretion—Remarks on the urine—Congestion of the kidneys (active and passive)—Temporary and intermittent albuminuria—Treatment of congestion.—ACUTE DESQUAMATIVE NEPHRITIS—*Local and constitutional symptoms—State of the urine and appearances under the microscope—Scarlet fever the most frequent cause—Pathology—Morbid anatomy—Prognosis—Case of acute desquamative nephritis from cold and exposure, terminating in chronic albuminuria—Treatment—Value of small doses of perchloride of mercury and perchloride of iron in the congestive stage.*

THE renal affections of children are less frequent than many of the ailments to which early life is liable, but there hangs about them an obscurity, which in a physiological point of view is perplexing, and in a clinical one, difficult to reconcile with our knowledge of disease, and of the active functions which the kidneys possess when health is continuously maintained.

In order to understand the disorders to which the kidneys are liable, it is well to glance at the renal apparatus in health, and to see how the different structures are concerned in the elimination of morbid elements from the blood.

Beale and Johnson say the water is first eliminated from the blood, and the urine salts are gradually added as the water passes down the tubules. Ludwig, Brunton, and others, entertain the view that the water of the blood, holding the different salts in solution, is first squeezed out in a very diluted form, and that the absorption of water goes on through the epithelial lining of the tubules, the urine thus becoming more concentrated as it passes down the tubules. The former assert, that the function of the epithelial cells of the tubules is to excrete urine salts, while the latter assert, that their true function is to absorb water.

There are two facts which stand in a very significant relation to these views—one, that after copious draughts of water the epithelial cells do not exert themselves in absorbing water freely, and so the urine is copious and of low specific gravity, while during thirst the epithelial cells absorb water more actively, and the urine is scanty and contains excess of salts. The other fact is, that in cirrhosis of the kidney, where the tubules are denuded of epithelium, the urine is copious and of low specific gravity.

The importance of this subject practically, is the question as to whether the urine, when first squeezed into the glomeruli, is albuminous or not. According to the view of Ludwig and others, it is primarily albuminous in a faint degree, and the albumen is reabsorbed along with much of the water by the epithelial cells of the tubules. According to the other view, albumen is thrown out along with the urine salts in disease of the urinary tubules. The question has not yet been settled, but the view of Ludwig seems more feasible, and consistent with the known fact, that albumen appears in the urine when the tubules are diseased.

On the assumption that the epithelial cells normally reabsorb albumen as well as water, we can readily understand how, in certain conditions, albumen is present in the urine. When the tubules are the subject of inflammation, they lose their power to reabsorb albumen, consequently albuminuria is constantly found in tubular nephritis, as we see commonly after scarlet fever. We can therefore understand how temporary derangement of the epithelial lining of the tubules *may* be followed by the appearance of albumen in the water. Such a condition may exist without the kidneys being necessarily organically diseased. In cases of albuminuria, then, the question arises, whether the passage of albumen in the water is due to conditions of temporary derangement, or to structural disease of the kidneys.

In the treatment of sick children, a constant observation of the urine is as important as in the management of disease in adult life. At all ages morbid conditions affect the secretion of the kidneys, and childhood is no exception to this rule. Even when not on the sick bed, the insidious effects of errors of diet, and other bad habits, are first shown in alterations of the amount of daily excretion of urine, and in changes in its constituents. Intemperance, the chief vice of man, directly affects the kidneys, so that the reveller longs to make water after a banquet. Gluttony, and the preference for rich, rather than wholesome food, are the commonest failings in childhood. Hence the turbid urine passed by children subject to gastric and intestinal irritation through over indulgence in sweets and pastry. Ignorance of the evil effects of draughts of cold air, and wet feet, renders children liable to catarrhal affections, which produce changes in the urine.

Since very slight disturbances produce feverishness in childhood, and since high temperature involves the excretion of concentrated urine, that fluid will almost always be found to be *above* the normal specific gravity in a children's ward, its acid reaction is likewise well marked under these circumstances. In fever among children, the thick and almost milky urine, turbid when passed, not merely turbid when cool, is highly characteristic. The turbidity is dissolved but slowly on boiling in a test-tube, for it is due to the urate of soda, insoluble in cold, and only sparingly soluble in hot water. In many febrile diseases, however, children pass clear urine which on cooling throws down the well-known deposit so readily re-dissolved on boiling in a test-tube. In this deposit the more soluble urate of ammonia predominates.

The urine of a child suffering from acute scarlatinal nephritis abounds in morbid products. It is smoky, or almost broth-like, from the presence of altered blood, and throws down a deposit rich in epithelial casts, and in the beautiful light yellow rhomboidal crystals of uric acid. Such urine must be carefully examined day after day, and its gradual return to a normal condition will be a valuable guide to the treatment of the case. Phosphates are often observed in the urine of nervous and sickly children, and in such cases the fluid may be copious and below the normal specific gravity; oxalates may also be found in pale abundantly excreted urine. Mucus is frequently deposited in the urine of children suffering from paraplegia, from spina-bifida, or from local causes, such as calculus, and is an unfavorable symptom, since it may denote serious changes in the genito-urinary tract; the presence of pus is due to the same causes as in adults. In cases of enuresis the condition of the urine must be carefully examined; when a morbid salt is discovered the administration of a drug which counteracts its formation often cures the patient, as the presence of such a salt in the bladder may alone cause the complaint.

We are not able to draw any satisfactory conclusions from the specific gravity of the urine in children. It varies greatly in the same diseases, though the diet and surroundings are in all respects the same. In 435 cases admitted into the Samaritan Hospital under my care, the average specific gravity of the whole number was 1023. The highest specific gravity reached was 1034 in four cases only:—1. Epileptoid seizures. 2. Congestive headache. 3. Tuberculosis. 4. Acute catarrh. In these cases the urine was pale, scanty and very acid. The lowest specific gravity was 1004 in a case of debility; it was 1006 in a boy, six years of age, on the fifth day of typhoid fever when it became pale, clear and alkaline. After taking small doses of hydrochloric acid for five days, the reaction became acid, and the specific gravity rose to 1018. The urine in this case was never turbid, nor threw down a deposit, notwithstanding that the temperature at one time reached 103·6.° In some cases of debility the specific gravity reached 1030. In a few cases of mitral disease (unaccompanied by albuminuria) the specific gravity fell to 1010. In 48 cases, it was below 1020; in 107 cases, it was 1030 or over; in 80 cases, there were phosphates—these being found in cases of debility, anæmia, indigestion, intestinal irritation, chorea, epilepsy, nervous shock, typhoid fever, mitral disease, rickets, pneumonia, pleurisy, &c. In no case was sugar found. There were only 5 cases of albuminuria in the whole 435 cases, one which followed scarlet fever, where the lowest specific gravity was 1018, one in a case of intermittent hæmaturia where the specific gravity was 1010, one in a case of albuminuria (probably of scarlet fever origin) where the albumen amounted to one half, and the specific gravity was 1018; one in a case of mitral disease and ascites, with a specific gravity of 1010, and one which occurred in a strumous girl, nine years of age, who had acute desquamative nephritis and anasarca. The specific gravity varied from 1016 to 1020, and the microscope showed irregular-sided granular casts, some uric acid, epithelial cells, and broken down blood-corpuscles. In three cases only were there large "cayenne pepper crystals," and these occurred in:—1. A case of tuberculosis, where the urine was highly acid, pale and scanty. 2. Lobular pneumonia. 3. Chronic albuminuria. A girl suffering from chronic mitral disease became very nervous, and afterwards her urine threw down a great deal of uric acid. The highest specific gravity in 34 cases of chorea was 1032; the lowest was 1010, the average was 1026.

Congestion of the kidneys is one of the most important disorders to which these organs are liable. It is a common attendant on many ailments of children, passing away with the recovery of the patient, and leaving neither inconvenience nor structural change behind it.

In measles and scarlatina, as well as in many inflammatory diseases, there is a determination of blood to the internal organs, and active congestion of the kidneys is of frequent occurrence. In measles it is often slight; it is notably more marked in some cases of scarlet fever, and there is a considerable amount of blood with casts of the uriniferous tubes and epithelial cells, so that the urine is albuminous. This is a point I shall more particularly consider when I come to speak of a state of congestion of the kidney, brought on, not by the scarlatinal poison, but by exposure, bad living, impure air, and the strumous habit.

The *passive* form of congestion, as in adults, is most common in mitral regurgitation, and other valvular diseases of the heart; in emphysema, pneumonic conditions, pleuritic effusion or disease of the liver, pressing on the vena cava. This form of venous congestion is owing to an impediment through the systemic veins. The passage of blood through the kidney is slow, and congestion takes place, the urine is scanty and high-coloured or turbid, and more or less impregnated with albumen. In obstructive disease of the heart, the fulness of the venous system distends the renal veins, and the Malpighian capillaries becoming engorged, a transudation of serum takes place through their walls, rendering the urine albuminous. When the walls of the capillaries are ruptured from this over-distension, blood is mixed with the urine, and blood casts are visible.

The first effect of passive congestion is to cause enlargement of the gland, and ultimately contraction and atrophy, the surface of the kidneys becoming uneven, and finely granular as the wasting process goes on (Johnson).

The *treatment* consists in relieving the circulation by hydragogue cathartics, absolute rest, and tapping of the chest or abdomen, if there is a large accumulation of fluid, and it cannot be got rid of in any other way.

Experimental research has demonstrated the fact, that a ligature placed around the renal vein, obstructing the return of blood, causes the kidney to increase in volume, and the urine to contain albumen, casts of the uriniferous tubes, and renal epithelium. Hence the liability, in inflammatory disorders, and checked cutaneous action, for the kidneys to become congested, like other organs, and so to create a disturbance in the intricate and nicely adapted circulation through the Malpighian tubes, and plexus of capillaries, which surround the uriniferous tubes.

Some cases of *intermittent albuminuria* are due to congestion of the renal vessels, or to loss of tone in them. An interesting case of this kind is alluded to by Dr Morley Rooke, of Cheltenham. There were no renal products under the microscope, the albumen disappearing with rest, but returning when the patient assumed a vertical position.*

In children, as in adults, the injudicious use of mercury may produce temporary albuminuria, either by setting up some blood change, or inflammatory condition of the renal structures. It passes away when the remedy is discontinued. Other irritants or substances, which find their way out of the system by the kidneys chiefly, as lead and alcohol, have the same effect.

Acute desquamative nephritis.—This disease follows the same course and presents similar symptoms in children to adults. The symptoms are those of general febrile action with a temperature which may reach 104°,† ‡ quick throbbing pulse, thirst, headache, and loss of appetite. There is pain in the loins and legs, and in a few days the face is pale and shrunken, the eyelids are puffy, so that the eyes cannot be seen; general anasarca or dropsy sets in early, and the hands and lower limbs are œdematous; effusion into the pleural sacs, pericardium, or abdomen are common, and pneumonia is occasionally present. At first the urine is scanty or almost entirely suppressed; it is dark from the presence of blood, and contains a thick sediment. If there is pain across the loins, or deep seated tenderness on pressure, more or less blood will often be seen, or detected under the microscope, with tube casts, and renal epithelium. The patient is restless and talkative in sleep, and if the urine does not increase in quantity, the poisoned elements in the blood will sometimes lead to convulsions, delirium, or coma. Convulsions are, however, infrequent in the albuminuria of children. As the disease progresses, and congestion of the kidneys diminishes, the urine becomes pale and increased in quantity, and the anasarca gradually disappears. Notwithstanding this, the albumen may be equally great in amount, and any error in diet, or cold, will renew the renal congestion and hæmaturia.

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* 'Brit. Med. Journ.,' Manchester Meeting, Aug., 1877.

See "Chronic Desquamative Nephritis," p. 230

"Under ordinary circumstances albuminous bodies do not diffuse through animal membranes, but it has been shown by Bernard, Pavy, Stockvis, and others, that albumen of eggs will pass out through the kidneys, while the albumen of blood does not do so under similar conditions" (Dr Lauder Brunton).—*Practitioner*, June, 1877, p. 427.

† Dr Dickinson mentions that he has no thermometric record, at the outset of this disease, of more than a few points above 100°. When uncomplicated, he has known the temperature to range for many weeks between 97·5° and 99·5°.—'Diseases of the Kidney,' part 2, "Albuminuria," 1877, p. 278.

‡ In the case I have related (p. 221) the temperature was 100·1° on admission; next day 102·2°, and on the fourth day it rose to 104°.

The microscopical appearances of the urine show epithelial casts of the uriniferous tubes. In these casts are to be seen blood-corpuscles and renal gland cells, besides small and large hyaline casts; but these are often indistinct, and cannot be seen for weeks together, even when there is a large amount of albumen. The large hyaline casts may be absent altogether (Johnson). As the disease goes on, oily casts and cells are detected in the tube casts, indicating that the secreting cells of the kidney are undergoing fatty change.*

The *causes* of this affection in childhood, are most frequently due to scarlatina, and to suppressed action of the skin following exposure to wet and cold. When the rash of scarlet fever is out, or the skin is desquamating, cutaneous action is checked by cold, and a morbid process is set up in the kidney. The circulation being impeded, the urinary constituents accumulate in the blood, and lead to dropsical effusions. It is generally admitted that the more severe the throat affection, the less likely are the kidneys to become affected; but it must be borne in mind that when the throat is very sore, the patient is treated with more care, and is not so likely to be exposed to cold, which would cause or aggravate kidney disease. Scarlatinal dropsy is most frequent from the tenth to the fourteenth day, but it may be delayed much later. One of the worst cases I ever saw occurred in a boy, seven years of age, on the nineteenth day. In two cases under my care, about the same time, the symptoms came on in one case at the end of the fifth week, and in the other case at the seventh week.

Nephritis in children has also been observed in connection with pneumonia, rheumatic fever, smallpox, typhoid fever, chronic dyspepsia, and the consumption of indigestible food. Next to scarlatina, diphtheria and measles are the most common causes.

Scarlatina, then, is the most frequent cause of acute nephritis, the kidneys being irritated as they assist in the removal of morbid products from the blood. This unhealthy stimulation throws upon these organs work to which they are unaccustomed, and as a consequence, they become congested, and the tubes choked up with exudation. If, at the same time, the patient is exposed to wet and cold during the shedding of the cuticle, symptoms of acute renal disturbance are set up, and dropsy follows. Dr Dickinson writes "That at the Children's Hospital, where children are treated up to twelve, a series of 103 cases of albuminuria connected apparently with renal inflammation, gave 75 where the disorder was traced to scarlatina, 3 to measles, 1 to erysipelas, 1 to acute rheumatism, and 1 in which it came on in the course of eczema; 5 from cold, and 17 from uncertain causes made up the tale."*

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* For further information on this subject the reader is referred to Dr George Johnson's 'Lectures on Bright's Disease,' 1873; Dr Roberts on 'Urinary and Renal Diseases,' 1877; and Dr Dickinson on 'Diseases of the Kidney,' part 2, "Albuminuria," 1877.

Boys are more liable to scarlatinal dropsy than girls, just as adult males are more prone to kidney disease than females. The greatest frequency in children is between the ages of five and fifteen. The association of tuberculosis with this disease is extremely uncommon.

Pathology.—In consequence of suppressed skin action, the kidneys become congested, through having to take on increased functional activity, whereby the organs become congested and swollen. Hyperplasia of the epithelial cells in the tubules then takes place, and these cells are incapable of separating the solid urinary constituents, which, remaining in the blood, give rise to the well-known symptoms already described. Hence, effusion takes place in the various tissues and serous sacs of the body. The blood undergoes changes in becoming poor and thin, falling in specific gravity, whilst albumen and blood appear in the urine from dilatation and rupture of the renal capillaries. For some time urea is eliminated by the vomiting and diarrhœa that ensue, but when these functions fail, the gradual accumulation of excrementitious urinary compounds in the blood, occasions convulsions or coma.

Morbid anatomy.—If death takes place during the acute stage, the kidneys are found congested and enlarged; they are of a dark red or chocolate colour, the cortex is mottled with spots of anæmia, and is ecchymosed, and the medullary cones are dark and congested. The uriniferous tubes are crowded with epithelial cells and blood, the walls of the capillaries are thickened, and congestion of the pelvis of the kidneys, ureters, and bladder, is found in addition to effusion into the serous sacs. After a variable period, the kidneys in some cases undergo degeneration (*chronic desquamative nephritis*).

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* 'Diseases of the Kidney,' part ii, "Albuminuria," p. 321.

Prognosis.—When the secretion of urine is free and there is not much blood or albumen mixed with it, the prognosis is favorable, and many cases due to scarlatina or measles completely recover; but if the albumen is in excess, and the urine is deficient in quantity, or the child is of a strumous constitution, the prognosis is bad. The subjoined case is a good and rare example of a very acute form of nephritis, terminating in complete recovery.

E. S—, æt. 9½, a fast-growing, strumous-looking girl, was admitted into the Samaritan Hospital under my care on June 15th, 1875, suffering from acute desquamative nephritis and anasarca. The parents stated she had never had scarlet fever, nor had the disease prevailed in the house or neighbourhood. The case seemed due to cold and exposure. On admission the eyes were almost obscured from œdema of the lids; the arms, legs, and thighs were tense from subcutaneous infiltration, and there was free fluid in the peritoneum. There was slight effusion into the left pleural sac (about a quarter of a pint); the first sound of the heart was a little prolonged, and louder than usual, but the valves were healthy. Temp. 100·1°, pulse 120, resp. 32. The mother said that she noticed her daughter's face swollen in December, 1874, but she had attended school regularly till a month before admission.

The urine was high coloured and turbid; reaction acid; sp. gr. 1010; it was thick and clotty on boiling, and the addition of nitric acid rendered the whole an albuminous curd-like mass, adherent to the test-tube.

June 16th.—There was much more œdema of the feet and legs, and the temperature was 102·2°. The urine was thick, scanty, and dark coloured, only twelve ounces were passed in twenty-four hours (although she drank freely of cold water), sp. gr. 1030; on the application of heat, the urine coagulated in large and divided clots. The addition of nitric acid converted it into a thick soapy mass, which admitted of the tube being inverted, while only a little fluid escaped, Under the microscope, there was not a trace of blood-corpuscle, urinary cast, or epithelial cell, which is unusual with this albuminous condition of the urine. She was ordered a mixture of tincture of digitalis with acetate of potash, and compound jalap powder occasionally.

19th.—The temperature had risen to 104°, and the pulse to 140; the anasarca had much increased, and there was great stupor and drowsiness. A third of the urine was albuminous, and on standing all night looked like barm. The microscope now showed large epithelial cells, probably from the straight portion of the tubes, and numerous blood-corpuscles, some of them altered and shrunken; a few epithelial cells from the convoluted portion of the kidneys, and two short and small granular casts. There was now acute nephritis, with a limited degree of desquamation.

Three days later, forty-four ounces of pale urine were passed in twenty-four hours. A few hyaline-looking casts, large and small, with here and there a renal gland cell, were seen under the microscope. Bark and hydrochloric acid were now substituted for the previous mixture. At the end of another week, seventy-five ounces of similar urine, with a low specific gravity, were passed in twenty-four hours. The tincture of the perchloride of iron was given in ten minim doses three times a day.

During the remainder of her stay in the hospital she passed above the average amount of urine, as the healthy functions of the kidneys were in slow process of restoration.

On the 24th of July she left the hospital feeling quite well, and presenting no trace of dropsy. The presence of albumen was doubtful.

On October 9th of the same year, the patient was readmitted with symptoms of acute desquamative nephritis. There was much anasarca of the face and limbs, which increased for a few days after admission into hospital. The urine was highly albuminous, and clotted like cream on the sides of the test-tube. The deposit contained granular casts, indicating the desquamation of cells already morbid; moreover, numerous cayenne-pepper crystals of uric acid were found, proving imperfect elaboration of the nitrogenous principles in the blood, from reduced functional activity of other organs.

In November she caught cold, and had an attack of acute renal congestion, followed by a large quantity of bloody urine, of a bright claret colour. At the close of the month, the urine was still dark, containing blood-corpuscles, broken irregular granular casts, and some fresh renal cells. For the first time I detected increased impulse of the heart, and intensification of the aortic second sound. The $\frac{1}{24}$ of a grain of perchloride of mercury was added to each dose of the mixture. There was slight reduplication of the first sound over the interventricular septum, and the apex beat was lower by half an inch.

January 11th, 1876.—A careful examination of the heart revealed the following condition. The second sound was intensified to a certain extent over the aorta, and to a greater extent over the pulmonary artery in the second left intercostal space. There was occasional doubling of the second sound over the conus arteriosus; there was no doubling of the first sound anywhere; cooing inspiration was audible over the upper lobes in front, but not behind. Apex beat in fourth interspace, and impulse extended to outer side of nipple. The pulse did not present the feeling of tension, and when the finger was lightly applied to the radial artery it felt the stroke and collapse. Sphygmographic tracing showed moderate tension; greatest sweep at about 150° to 200°; systolic rise was not anywhere greatly prolonged.

27th.—At her mother's request the patient left the hospital, her general health was good, and all dropsy had disappeared. The urine was clear and acid, sp. gr. 1020; it contained only a trace of albumen. This favorable change was attributable to the perchloride of mercury, which she had continued regularly up to this time.

June 11th, 1877.—She was perfectly well in health, and had remained so ever since January, 1876. She had never any headache, sickness, or diarrhœa, and her mother considered her as well as at any time of her life. She was fed on oatmeal porridge and milk every morning, and had meat three times a week.

Analysis of urine.—Clear bright yellow, with mucous cloud; sp. gr. 1024; faintly acid reaction. Became very milky with heat, and the cloud was partially cleared with effervescence by the addition of a few drops of nitric acid (phosphates). Albumen a sixth part.

The *microscope* showed ordinary squamous epithelium, and a quantity of hyaline tube casts, but they were very indistinct. The high specific gravity is unusual with such albuminous urine.*

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* There are several points in which this case is both suggestive and instructive, showing as it does, in a very striking manner, that the presence of a large amount of albumen in the urine is not incompatible with active growth of the body, and a good state of health. When such cases as these occasionally come under close observation, and opportunities are afforded of studying their course and progress, we may reasonably commit ourselves to the assertion, that whenever a large amount of albumen is daily separated from the blood for many months, it must indicate pathological changes in the renal organs of a chronic and incurable nature.

It is remarkable, and very exceptional, that the retained urinary excreta should cease to give rise to any constitutional symptoms when there was no vicarious discharge from

As a rule, children recover more frequently from the dropsy of scarlatina and other febrile diseases, than from that which is due to cold and constitutional causes. Usually the disease terminates in six months, but it may assume a chronic form, and be indefinitely protracted; the interstitial tissue of the kidneys increases, and contraction ensues. Of 50 fatal cases under the age of sixteen, 28 died from diseases of the respiratory organs, including pneumonia, pleurisy, bronchitis, and empyema. Of the remaining 22 cases, death was caused by uræmic convulsions in 8, by pleuritic effusion in 5, by vomiting in 3, by peritonitis in 4, by pericarditis in 1, and by sloughing of the scrotum in 1. (Dickinson.)

Now as to the general management of these cases. When the primary cause of the disease can be ascertained, we may do much in mitigation, or cure of the symptoms, by directing careful attention to all those points which bear upon the original malady. If the albumen be due to pressure from morbid growths, or to an enlarged liver, we know the best plan to adopt in mitigation of the evil; and if the thoracic organs are unhealthy, they may induce renal changes through obstruction to the circulation. We may excite the action of the skin by the warm bath, and by diaphoretics; we may relieve the portal circulation by efficient purgation, and thus we can indefinitely prolong life if there is no hope of saving it. But all drugs and therapeutic agents are secondary to diet, for the closest relation exists betwixt the solids and fluids taken in as food, and the condition of the urinary secretion.

Treatment of acute desquamative nephritis.—The patient should

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the stomach or bowels going on, to wash out the impurities from the system. There was no flatulence, dyspepsia, or any complaint whatever, and the slender ankles, healthy features, and the hue of the countenance, indicated a return to health, though the patient was living in a poor home, without much care or attention to diet.

In this case we may explain the coexistence of albuminuria with good general health on the hypothesis, that a mild subacute inflammation of one, or even both kidneys, was at one time going on. Such a condition is not incompatible with an almost perfect functional activity of the kidneys in other respects, and may be compared with chronic catarrh of the mucous membrane of the nose and bronchi, where inflammatory products are discharged for years. But the fact must not be overlooked, in this and similar cases, that continued congestion, whether it be inflammatory or otherwise, ultimately tends to modify the nutrition of the kidney, and to alter the glandular structures, so that in time it leads to atrophy and contraction of the organ.

Since the above remarks were written I have had an opportunity of examining the patient (March, 1884). She was then strong and healthy, and the urine quite normal.

In the previous edition of this work, I quoted the case as an example of acute desquamative nephritis terminating in albuminuria and structural change.

be kept in bed, and the temperature of the apartment maintained between 65° and 70°, but well ventilated, and free from currents of cold air. In all cases, and particularly where the secretion of urine is scanty, diluent drinks should be taken freely, and the diet be very scanty. For children, milk is the only nourishment necessary, as it does not irritate the kidneys. If the milk disagrees, or the patient tires of it after a time, or it causes constipation, a little veal broth or mutton broth must be substituted, and barley water, sago, or arrowroot are useful, but in every case the patient must soon return to a milk diet. Alcoholic stimulants should be prohibited.

To reduce the inflammation, cupping, or leeches to the loins may be necessary, if the child is strong enough; but if there is much hæmorrhage from the kidneys the patient may be too weakened and aperients and diaphoretics will be safer. A diaphoretic mixture containing antimony, or a solution of acetate of ammonia, will determine action in the skin, and relieve any dropsical effusion that may be present. It is important to unload the bowels well, and for this purpose, a purge occasionally of compound jalap powder, will relieve arterial tension if present, and rouse the kidneys to freer action. A fair allowance of fluid should be taken to wash out the tubes, and to prevent their obstruction. In this way the congestion of the renal organs is relieved, and there is a better chance for all the constituents of the urine to escape. Water is the best diuretic (Dickinson), and it may be taken to the extent of two or three pints daily. The bitartrate of potash drink, flavoured with lemon and sweetened with sugar, is very agreeable; whilst it helps to clear the renal channels of morbid secretions, it keeps the bowels free, and also assists in relieving the contamination of the blood.

A mixture of citrate of potash and tincture of digitalis increases the quantity of urine, and, so far as my experience goes, has no tendency to aggravate renal congestion. It is a favourite remedy with me when the secretion is scanty and high coloured, or contains blood, although Dr Dickinson is of opinion that digitalis, by adding to the force of the heart, may increase the discharge of blood. In the form of infusion, digitalis is a good diuretic, and one or two drachms may be taken three times a day.

In the early stage of the acute affection, warm baths, or the hot vapour bath, may be used with great advantage. They are particularly suitable for children, if the action of the skin is defective, and there are any signs of cerebral oppression. The sweating that ensues brings immense relief to the system, unloading the capillary circulation, and lessening the distension of the renal vessels. The baths may be employed every night on going to bed, for the first few nights and then less frequently. The temperature may vary from 98° to 100°, and the child may be immersed from 10 to 15 minutes. Dr George Johnson speaks highly of a wet sheet and blanket bath. "A sheet is wrung out of warm water, and the patient, either naked or covered only by a shirt, is enveloped in the wet sheet up to the neck. Then three or four dry blankets are closely folded over the wet sheet. He may remain thus packed from two to four or six hours, or even longer. Recently, a boy in the hospital with acute renal disease and almost complete suppression of urine, consequent on scarlet fever, was kept packed incessantly for four days without serious discomfort, and with great relief from very distressing and alarming symptoms. When he left the hospital all traces of his malady had disappeared."*

If head symptoms in the character of convulsions, or coma supervene, we may generally attribute them to a poisoned state of the blood (uræmia), or to an anæmic state of the brain through some source of exhaustion, as protracted vomiting or diarrhœa. Yet it is remarkable that some severe cases of nephritis in children, with an enormous escape of albumen from the system, are not accompanied by headache, or cerebral symptoms of any kind. If they are present and the head is hot or painful, cold lotions may be applied, or a mustard poultice to the nape of the neck will be serviceable. Bromide of potassium or hydrate of chloral may be needed to calm the cerebral irritation, and a free action on the bowels and kidneys must be kept up, so that the morbid products may be gradually eliminated from the circulation. When uræmia produces headache, delirium, convulsions or coma, purgatives should be given freely, and if the kidney affection be acute, the treatment will often prove successful. Purgatives are even more strikingly useful here than in inflammatory affections of the brain and its membranes.†

Inflammatory complications, as pleurisy, pericarditis, bronchitis, and peritonitis, must be treated on general principles, always remembering that the kidney disorder is the cause of the evil.

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* 'Lectures on Bright's Disease,' 1873, p. 133.

† Ibid., p. 136.

Diaphoretics and local applications, with careful regulation of the diet, are the remedies to be relied upon.

When the acute stage has passed, and there is passive congestion of the kidneys, our treatment must undergo considerable change. Of all remedies, none are equal to small doses of perchloride of mercury, combined with the tincture of perchloride of iron, when every trace of blood has disappeared from the urine, and there is sufficient albumen to justify the opinion that renal congestion is present. When the evidences of general debility and anæmia are most prominent, the perchloride of mercury should be withdrawn, and the iron given alone. In some cases, the vinum ferri, or the acetate of iron, may be ordered according to the discretion of the practitioner, and if there is a deficiency of renal secretion, the bitartrate or the acetate of potash may be added.

CHAPTER XXIII (*continued*)

DISEASES OF THE KIDNEYS AND URINARY ORGANS

CHRONIC DESQUAMATIVE NEPHRITIS.—*Sometimes follows an acute attack after scarlet fever or exposure to cold—May be associated with* (1) *the large white kidney;* (2) *the red granular kidney—Symptoms of the disease with the large white kidney —Character of the urine—Albumen occasionally absent in confirmed cases—Conclusions to be drawn from a microscopic examination of the urine—Small red granular kidney rare in early life—Symptoms and morbid appearances—Cardio-vascular changes—Lardaceous or waxy kidney—Nature and causes—State of the urine in—Treatment of chronic Bright's disease in the different varieties of the affection.*

CHRONIC DESQUAMATIVE NEPHRITIS is a very rare disease in children. It may be the consequence of an acute attack after scarlet fever, or exposure to cold, but in by far the greater number of instances it creeps on slowly, and belongs to adult life. The course it follows and the symptoms it presents in children, are in all respects like the same disease in the adult. If the acute stage does not pass away completely, and any inflammation remains behind, the urinary tubules become plugged with a fibrinous or exudative material, which interrupts the circulation through the gland, and by favouring a state of habitual congestion, renders the chances of recovery less promising.

After an attack of acute Bright's disease (*acute desquamative nephritis*), when the constitutional symptoms have improved, and the urine remains persistently albuminous, the patient is exposed to a return of the disorder from cold, or errors in diet, renewing renal congestion, and paving the way for incurable degeneration. This chronic form of disease may be associated with (1) *the large white kidney;* (2) *the red granular kidney.*

It appears that we may have disease of the kidneys commencing in (1) *the epithelial lining of the tubules*; (2) *in the fibrous tissue*; (3) *in the blood-vessels.* The symptoms and morbid appearances are characteristic of each variety to a great extent, and ought to be carefully studied in their clinical history and pathological bearings. When the urinary tubules are inflamed and irritated by the passage of a specific poison through them, as in scarlet fever, they take on an excess of cell growth, and, as exudation proceeds from the congested vessels, the kidney increases in volume, and becomes large and smooth. The capsule peels off readily (*large white kidney*). If the disease is not arrested, or cured, the morbid alterations continue, and the mischief extends to the intertubular structure, at the same time the growth of fibroid tissue begins, which may end in contraction and granulation. The kidneys are reduced in size to one half, especially in the cortical part, and the surface instead of being smooth is irregular and granulated. They are firm and fibrous, and the capsule thickened and adherent. The depressions and granulations are produced by the contraction of the fibrous tissue between the tubes (*granular kidney—cirrhosis of the kidney*).

The large white kidney is the sequel of an acute attack of nephritis, particularly after scarlet fever, or exposure to cold. The dropsy and œdema, if present during any time of the acute affection, pass off more or less completely, leaving the state of the urine to tell the mischief that has been inflicted upon the renal organs. The albuminuria may continue for months, or even years, before symptoms of degeneration ensue, or, indeed, at a time when the general health is in no way deranged. This, however, will greatly depend on the amount of albumen in the urine; if there is only a mere cloudiness, or opalescence in the secretion, the health may be unimpaired, and the patient perform the usual duties of life without suffering any inconvenience, but a copious precipitate cannot continue very long without the liability of a return of dropsy and inflammatory complications. The disease sometimes commences as a chronic disorder.

The general symptoms of *chronic disease with a large white kidney* when pronounced, are a pale and pasty face, and dropsy. There is loss of appetite and nausea, and the bowels and stomach are easily deranged, diarrhœa and vomiting being very common. In the case of a girl under my care in 1876, the profuse albuminuria was attended on three or four occasions with severe epistaxis, preceded by frontal headache. Troublesome cough, from congestion of the lungs and bronchial irritation, often prove extremely inveterate, whilst pericarditis and serous effusion into one or both pleural sacs are not uncommon. Cerebral symptoms from uræmia, and hæmorrhages and extravasations of blood, more especially belong to the granular form of the complaint.

The urine is generally pale and of normal specific gravity; as the disease proceeds, a microscopical examination detects granular and hyaline casts. The variability in the amount of albumen in the urine from time to time is just one of those circumstances which requires especial notice and attention. The patient to whom I have alluded presented a good example of this when the chronic stage was established. There were days when the albumen was so small in quantity that the urine revealed on careful examination a mere trace, and I had my doubts whether it was present at all; but when the urine was allowed to stand a few hours, after carefully employing the usual tests, its presence could invariably be verified. I can only connect this temporary decrease of albumen to some mysterious process of digestion.[*] In many cases of albuminuria the albumen is present in the urine chiefly, indeed, in many cases solely, during the period of digestion; just as in some cases of diabetes, the sugar is found in the urine mainly, and sometimes only, during digestion.[†]

A case of albuminuria is described in an infant seven weeks old. It was born healthy, but soon after birth suffered from constant vomiting. There was no history of scarlatina or measles, and no evidence of disease in the thorax or abdomen; indeed, the child lay listlessly in any position in which it was placed, and apparently suffered no pain whatever. The urine was "almost like pure water, and containing sufficient albumen to make a deposit of some height in the test-tube." Emaciation followed, and death took place at the end of a month. As the kidneys only presented some spots of congestion, the case was considered as one of albuminuria from imperfect digestion and assimilation of the albuminous constituents of the food.[‡] In other cases albumen is never present in the urine except after severe exercise. The question may, however, be asked, is albumen in such a case as this ever entirely absent from the urine? Dr Roberts relates the case of a girl, æt. 8, who came under his care in April, 1864. She had general anasarca after scarlet fever four months previously. There was excessive pallor, shortness of breath, and a puffy, pasty face. The urine was scanty and high coloured, but not a trace of albumen or tube cast could be found. She died four weeks after admission. On a post-mortem examination, "the *kidneys* were good examples of the 'smooth, white' Bright's kidney." They were slightly enlarged, and the capsule peeled off readily. The surface was depressed here and there, and atrophy had commenced.*

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[*] Temporary albuminuria may arise from indigestible articles of food, as some kinds of cheese, shell-fish, crabs, cockles, mussels, &c. Nervous excitement and mental emotion will also give rise to it.—Dr Basham on 'Dropsy,' 1866, p. 306.

[†] See the remarks on "Intermittent Albuminuria" p. 218.

[‡] "Albuminuria in a child seven weeks old," by G. F. Helm, B.A., F.R.C.S., 'Lancet,' Jan. 18th, 1868, p. 85.

There are some points worth considering here in reference to the microscopical character of the urine. In the earliest stages it is scarcely altered, being, as we have before mentioned, of normal colour and specific gravity, but more or less albuminous. When death occurs before fatty casts and cells are detected, the kidneys are in the first stage of degeneration (*large white smooth*). When small hyaline and oily casts and cells appear in the urine, there is a process of atrophy (*fatty degeneration*). When granular and large hyaline casts appear, there is a further contraction of the kidney, or the disease is in the third stage (*granular degeneration*.)

After death the kidneys are found—1. Large, white and smooth. 2. The same appearance, with yellowish opaque specks on the surface (granular fat kidney) or large white kidney, with fatty degeneration. 3. Atrophy of the cortical portion, with an uneven granular surface (Johnson).

The small red granular kidney so far belongs to advancing years as to be hardly worth noticing under the diseases of early life. It is a chronic and insidious disease from the commencement, and although associated with the gouty diathesis more particularly, no cause can be assigned in a large number of cases. It holds no relationship to tubercle whatever. Dr Dickinson has seen the disease in a girl of 5. He mentions another case in a girl under the late Dr Hillier who died at the age of 10, and one under Dr Ogle, at St George's Hospital, of a boy who died at 11, "with granular degeneration traceable to scarlatina." Dr Dickinson had two fatal cases under his own care at the respective ages of 12 and 14.† The disease has succeeded to scarlatina contracted many years previously. A case is related by Barthels* of a girl who at 10 years of age had ague, measles, and scarlet fever, but no dropsy. At 18, after being in good health for eight years, she became affected with albuminuric retinitis; there was albumen, with small hyaline casts in the urine, and hypertrophy of the left ventricle. Maddening headache and obstinate vomiting succeeded to diminished urinary secretion. She became completely blind, and had five convulsions of an epileptic character in one day. To these symptoms succeeded twitchings of the muscles, profuse diarrhœa, and death from exhaustion. After death, the kidneys were found atrophied, and the surface mottled and covered with shallow depressions; the substance of the organs was tough; renal arteries large; there was purulent peritonitis and ulceration of the mucous membrane at the lower end of the ileum; the brain was pale and firm; the left ventricle of the heart was hypertrophied.

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* 'On Urinary and Renal Diseases,' p. 408.

† Part 2, "Albuminuria," p. 376.

The kidney in this disease is much reduced in weight, the surface is rough and irregular, and the capsule so thickened that it cannot be torn off the surface beneath without removing some of the tissue. Some of the urinary tubules are denuded of epithelium, and others contain fibrinous deposit. The urine, in granular disease of the kidney, contains a small quantity of albumen, and is copious and of low specific gravity; epithelial, granular, and hyaline casts are found under the microscope.

Dropsy is almost certainly absent, but there may be transient puffiness of the eyes and ankles. We often find dyspnœa on exertion from œdema of the pulmonary tissue or cardiac change; and in these cases the face is sallow rather than white.

With these changes the heart becomes hypertrophied, and the arteries thickened. Simple cardiac hypertrophy is a common accompaniment of *granular disease of the kidney;* the morbid matters, not readily passing through the capillaries, raises the blood pressure in the arteries, and, an obstruction thus being created in the blood flow, the left ventricle hypertrophies. For a long time there may be no signs present except accentuation of the aortic second sound or reduplication, but not necessarily any murmur, unless the valves are diseased. Atheromatous change has been found in the mitral valve and aorta, associated with granular fibrosis of the kidney at the age of six.† The muscular coat of the small arteries undergoes thickening, and even degenerative changes. The sphygmograph affords ample evidence of this in the characteristic tracing, and the finger placed on the pulse detects tension and hardness. This increased effort on the part of the heart and systemic arteries, causes both to become hypertrophied. As the heart increases in power the vessels lose their elasticity and become brittle, whilst the force with which the blood is driven through their channels, frequently leads to rupture and extravasations. The researches of Sir Wm. Gull and Dr Sutton are in the direction of proving, that the view advanced by Dr Johnson is unsupported by their experiments and investigations; they consider that blood charged with urinary excreta does not satisfactorily explain the cause of hypertrophy of the heart, and the arterial changes in the muscular coat of the smaller vessels. This change in the minute arteries is due to the formation of a "hyalin-fibroid" substance in the intertubular parts of the kidney, "and that, in fact, the muscular coat is often variously atrophied." The cardio-vascular changes are not consecutive to the renal mischief; they may be independent of it, and the contracted granular kidney, forms only part of a general morbid condition. These observers admit the frequent association between hypertrophy of the heart and renal degeneration, but at the same time they consider that this is no proof of any relation between them of cause and effect. The large white kidney, the granular contracted kidney, and the lardaceous kidney have been found when the heart was free from hypertrophy. For further information on this subject I refer the reader to the paper of Sir Wm. Gull and Dr Sutton.*

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* 'Cyclopædia of the Practice of Medicine,' by Dr H. Von Ziemssen, "Diseases of the Kidney," vol. xv, p. 429.

† Dickinson, op. cit., p. 412.

The next form is that known as the *lardaceous or waxy kidney*. It has also received the name of *amyloid kidney*. A wax-like material is found infiltrating the kidney, commencing in the muscular coat of the minute arteries; this imparts to the kidney a smooth and anæmic look. When the disease is far advanced, the gland loses all its smoothness, and becomes shrunken, uneven, and puckered. On incising the surface, the natural structure is seen to be much wasted, the cortex is bloodless, and the cones red, whilst the whole organ is much more tough and hard. This disease is secondary and constitutional, not local. It consists primarily in a change in the composition of the blood, and secondarily in the walls of the arteries, as well as all the organs of the body which they supply.*

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* 'Med.-Chir. Trans.,' vol. lv, 1872, "Chronic Bright's Disease with Contracted Kidney (Arterio-capillary Fibrosis)."

The striking peculiarity of the morbid deposit is a deep brown-reddish colour, which it assumes on the addition of a weak solution of iodine.

The *causes* of the disease, are chronic suppuration from caries or necrosis of bones, scrofulous abscesses, phthisis, chronic bed sores, syphilis, &c.

The disease is essentially chronic, and most common in males. It is most frequent between 20 and 30. Dr Dickinson has seen it in a child of 5, and he alludes to the case of a boy 2½ years old, under Dr Gee, who died from chronic abscesses in the thigh and pyæmia.† The disease is recognised during life by a worn and cachectic look; by the copious secretion of albuminous urine; and by the presence of œdema and dropsy. The urine is abundant in the early stages, but, as the complaint advances, it becomes scanty, very albuminous, and of high specific gravity. "Cells resembling those of pus are occasionally found, either separate or aggregated round a cast. The tube-casts are usually hyaline, and do not yield a brown colouration with iodine. Epithelial casts are also sometimes seen."‡ They are sometimes granular, or they contain fatty epithelium (Green).

Treatment of chronic Bright's disease.—To aim at a cure or to give relief in this formidable complaint, we must bear in mind the course of the malady and its tendency towards a fatal termination; for in so doing we know what symptoms to expect, and how best to avert or relieve them when they threaten. The cause having been ascertained, we may learn how to approach the disease in its milder forms, with some chance of success. Is it the sequel of an acute attack, or a chronic insidious disease from the first? Is the constitution fairly good, or the health broken down? For on the issue of these questions our opinion may be in a great measure guided. In one case, the tendency of the renal changes will be to cause cerebral trouble in the form of chronic headache, confusion of ideas, and convulsions or coma; in another case, inflammatory complications of the serous cavities, in a third, anasarca or dropsy; in a fourth, derangement of the stomach and bowels is the chief evidence of the poisoned blood; in a fifth, the changes fall chiefly on the systemic vessels, and the left ventricle of the heart, producing for a time no other indication of failing health, than stupor and inactivity, nausea and capricious appetite, or occasional epistaxis or hæmaturia.

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* See Chap. XXI—Lardaceous or Amyloid Disease of the Liver, p. 204.

† Dickinson, part 2, "Albuminuria," 1877, p. 491.

‡ 'On Urinary and Renal Diseases,' by Dr Roberts, 1876, p. 491.

If the chronic disease has succeeded to the acute variety of the affection, as after scarlet fever, or exposure to cold, great care is required not to submit the patient to changes of temperature, or to an irregular diet, as acute renal congestion is re-kindled on slight provocation. If there is chronic disease of any bone or joint, and the albuminuria appears to be dependent on these affections, then the source of such irritation should be removed if possible, before the patient's strength is worn out, and the renal degeneration is too far advanced.

If there is local pain to any extent across the loins, the patient should be put to bed and a linseed poultice applied. If the urine is turbid and contains renal blood casts, it is advisable to make the child lie on the abdomen to lessen the renal congestion, and to give diluents and fluid diet. In one case immediate relief followed the adoption of this simple method of treatment.

When the patient is well enough to be out of doors he should be warmly clothed, with flannel next the skin, and the greatest care be taken to avoid cold. A residence at the seaside is to be recommended, and moderate exercise may be taken if the disease is not so far advanced as to prevent it.

All treatment will be futile without the most rigid attention to diet, and this should consist chiefly of milk, or milk-and-water, if there is much albumen in the urine, and renal congestion is present to any extent. Animal food should be prohibited under these circumstances, for if indulged in, it will increase arterial tension, and derange the digestive functions. This is not borne out by the experience of some writers, who consider that animal food should be given as soon as the stomach will bear it. "It is a most remarkable fact that the albumen in the urine *decreases* by the use of animal food, and *increases* again under a vegetable diet."* But this testimony is quite at variance with my experience, as the case of E. S—, related at p. 221, very strikingly proves.

All stimulants should be prohibited as they are apt to produce deleterious consequences. Children do not require them in health, and there is no disorder in which they would prove more injurious.

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* Basham on 'Dropsy,' 1866, p. 217.

If anæmia is a leading feature of the complaint, the liquor ferri perchloridi is a good hæmatic, and a safe diuretic at the same time. When the urine is deficient in quantity, and there is any anasarca from renal inadequacy, the efficacy of the tincture of the perchloride is well spoken of in combination with the liquor ammoniæ acetatis. The late Dr Basham added a few drops of the tincture, according to the age of the patient, to a drachm of the liquor ammoniæ acetatis, previously acidulated with acetic acid.[*] Dr George Johnson combines with each dose of the perchloride of iron, ten grains of the hydrochlorate of ammonia, and he believes that the ammonio-chloride of iron is a useful preparation.[†]

If there is any renal congestion, the addition of small doses of perchloride of mercury to the liquor ferri perchloridi, as previously referred to under the acute affection, will be advisable. The syrup of the iodide of iron, the syrup of the phosphate of iron, or steel wine, in combination with cod-liver oil, are useful preparations in strumous subjects, and may be taken advantageously for weeks together. However important it may be to improve the quality of the blood in chronic Bright's disease by the exhibition of ferruginous preparations, they cause in many instances so much headache and constipation, that they cannot be given alone for any length of time; if the headache is dependent on congestion rather than on anæmia, they must be set aside for other remedies. The bowels ought to act once every day at least.

Sometimes the mineral acids—phosphoric, nitric, or hydrochloric—are useful where the loss of albumen is excessive, and there is atonic dyspepsia. Gallic acid seems to be ineffectual in lessening the drain of albumen.

Dr Lander Brunton found that strychnia in doses of gr. $\frac{1}{20}$th stopped the albumen in a case of chronic and intermittent albuminuria, but caused sickness and headache; in the same case pancreatic emulsion stopped it at first, but afterwards it became worse than ever; quinine and sulphuric acid doubled the quantity in twenty-four hours. But the same authority speaks in the highest terms of arsenic, which acts "upon the secreting structures of the kidney . . . and appears also to possess a special affinity for epithelial structures." He gave Liq. Fowleri ♏iij at meal times and the albumen disappeared, reappearing when the arsenic was discontinued, and again arresting the albumen when the remedy was resumed. The case in question was supposed by Dr Brunton to be due to "imperfect digestion of albuminous substances which were absorbed from the intestine, and excreted in the urine in much the same way as white of egg would have been if the person had swallowed several raw eggs at once."*

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[*] 'On Dropsy,' 1866, p. 218.

[†] 'Lectures on Bright's Disease,' 1873, p. 138.

For any dropsical condition that may exist, a dose of the compound jalap powder, with a little bitartrate of potash, is a good and quickly acting aperient, which may be given once or twice a week in a little tea or plain water, early in the morning, but even this aperient must be employed with due consideration to the general strength.

If anasarcous effusion be great, it may be necessary to puncture the extremities. The ordinary practice is to make one or two punctures through the subcutaneous tissue on the dorsum of the foot or calf of the leg, from half an inch to an inch in length, and then to wrap the limb in hot moist flannel. I have repeatedly made a small puncture either on the dorsum of the foot or over one or both ankles, and then wrapped the limb in dry flannel, changing it as often as it becomes very wet. I have never seen any local irritation or erysipelas follow this plan, though the drain of fluid in some cases has been enormous. Dr Southey has recorded the notes of a case of parenchymatous nephritis, in which the anasarca was combated by drainage-tubes and small silver cannulas. The advantages claimed were, that one puncture in each limb was sufficient, and that sores and erysipelas were not so likely to ensue; the cannula could be kept in the same opening without inconvenience for forty-eight hours, and when the instrument was withdrawn the orifice closed at once. Above all the patient is kept dry. Several pints of dropsical effusion may thus be safely and painlessly drained away in the course of one day.† Dr Southey found the same plan equally advantageous in drawing away pleuritic effusions‡

Diuretics are sometimes serviceable to assist in the removal of dropsical effusions. In some forms of the disease diuresis is profuse enough to contra-indicate their use. They are infinitely less valuable than purgatives, which relieve the portal circulation and intestinal veins, by inducing watery secretion from the bowels. I have a great preference for digitalis, with acetate or citrate of potash, when an alkali is not objectionable.

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* "Arsenic in Albuminuria," 'Practitioner,' June, 1877, p. 432.

† 'Clin. Trans.,' vol. x, 1877.

‡ Ibid., vol. xii, 1879.

Bronchial and dyspeptic symptoms require no special consideration; they must be treated according to the circumstances of each particular case, remembering that the strength of the patient is to be carefully husbanded, and that mercury and antimony, if occasionally required, are seldom necessary.

If uræmic symptoms threaten, the action of the skin and kidneys must be encouraged. The poisoned and watery state of the blood will seldom admit of venesection or any kind of depletion.

An occasional warm bath is an excellent diaphoretic, by promoting the action of the skin, and increasing the secretion of urine at the same time. The skin becomes supple under its use, and a general amelioration in the patient's condition takes place. I have known headache relieved when the temperature of the bath has not exceeded 98°, but if higher, and there is no free sweating, headache, capillary engorgement of the face, and other distressing symptoms may ensue.

Finally, we may repeat that warm clothing, thick boots, care against cold, especially in the evenings, and a seaside residence ought to be rigidly enforced.

CHAPTER XXIII (*continued*)

DISEASES OF THE KIDNEYS AND URINARY ORGANS

LITHIASIS.—SYMPTOMS OF STONE IN THE KIDNEY AND BLADDER.—OXALURIA.—HÆMATURIA.—TUBERCLE OF THE KIDNEY.—CANCER OF THE KIDNEY.—HYDRONEPHROSIS.—INCONTINENCE OF URINE.—DIABETES MELLITUS.—DIABETES INSIPIDUS.—ACUTE CYSTITIS.—*Causes—Symptoms and treatment.*

Calculous disorders are very common in early life, from the liability of the digestive functions when deranged to cause irritation in the urinary passages. The imperfect assimilation of the nitrogenous principles of food checks their downward metamorphosis to urea, so that a quantity of intermediate products are formed; these products are either insoluble, or, at least, irritating to the genito-urinary organs. Children who come of gouty parents are liable to these affections. Cold, and whatever else checks the cutaneous functions, will act as an exciting cause, so will portal congestion. Undue acidity of the urine takes place, and uric acid is precipitated.

Lithiasis is recognised by pain and weight about the loins, and difficulty in voiding urine, which is scanty and high coloured; it becomes turbid on cooling, and has a strong sickly odour. Free uric acid falls to the bottom of the vessel, on standing, like brick-dust. The digestive functions are deranged, the tongue being furred, the appetite excessive, and the bowels costive. The child is restless and feverish at night, and loses energy and activity. The white or pink tinge of the urates depends upon the amount of colouring matter in the urine. The 'milky urine,' of young children, is due to a deposit of peculiarly white urates.[*][†] The pink or brick-dust deposit, only visible after the urine has cooled, and readily dissolved by heat, consists of what was once termed, the amorphous urate of ammonia coloured with purpurine, but it is chiefly formed of urate of sodium. Uric acid, when in solution, is combined chiefly with sodium.*

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[*] 'Guide to the Examination of the Urine,' by Dr Wickham Legg, 2nd edition, 1872, p. 48.

[†] "In the urine of children it is very frequently met with in the form of small spherical globules very like the crystals of carbonate of lime from horses' urine; and these sometimes occur in the adult."—*Urine and Urinary Deposits*, by Dr Beale, 1861, p. 275.

When a careful section of the kidneys is made, yellowish or brownish striæ may be seen running towards the base of the pyramids. This appears to be a post-mortem change arising from the precipitation of the urates into the uriniferous tubes.† When it occurs during life it may prove the commencement of those changes which lead to gravel or calculus, blocking up the uriniferous tubes, and finally causing them to become impervious, or the concretions escape into the pelvis of the kidney, where they may be seen in large numbers after death.

The symptoms of stone in the kidney, or of the descent of a calculus from the kidney to the bladder, are less marked in children than in adults. There is febrile disturbance, and pain and difficulty in passing water, with localised pain and tenderness over one loin. In severe cases, there is faintness and vomiting, and the skin is bedewed with a clammy sweat. Uric acid calculi have been seen in the pelvis of the kidney of an infant. The occurrence of colic in children of three or four years old is often attended with uric acid gravel (West). Dr Debout d'Estrees gives an account of a child at Contrexeville, born of gouty parents, who had nephritic fits at a fortnight old. The mother twenty-six years of age, suffered from uric acid gravel for four years, and during her pregnancy she had three fits of nephritic colic. A fortnight after the birth of the child, it had real nephritic fits, which returned every six weeks.‡ It must always be borne in mind that it is most difficult to elicit symptoms of localised pain in children.

The treatment of *dysuria* and *uric acid gravel*, when severe, consists in the employment of warm baths at bedtime, which relieve the pain of micturition and encourage diaphoresis. If there is reason to think from the local and recurrent pain that a concretion has formed in the kidney, hot poultices to the loins will be advisable. The bowels must be kept freely open, and for this purpose there is nothing better than a full dose of castor oil. After this a mixture of liquor potassæ and tincture of hyoscyamus will lessen the acidity of the urine, and promote its free discharge. The diet should be sparing and unstimulating, and should consist of milk-and-water, barley water, and thin arrowroot. No animal food should be given whatever till the urine has assumed a healthy state, and pain and irritation have passed away. The waters of Carlsbad and Vichy are very useful.

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* "Lumleian Lectures," by A. B. Garrod, M.D., F.R.S., 'Brit. Med. Journ.,' 1883, vol. i, p. 601.

† 'On Urinary and Renal Diseases,' by Dr Roberts, 3rd edition, 1876, p. 477.

‡ "A Few Words on the Causes of Gravel," 'Practitioner,' June, 1877.

In children, *calculi* and *urinary sediments* usually consist of urates, hence the alkaline carbonates are very serviceable, and they may be persevered with to great advantage. Taken as carbonates by the mouth, they appear as such in the urine, sometimes rendering it neutral or even alkaline. When an alkaline citrate, acetate, or tartrate is taken as such into the stomach, it is decomposed into the system, and appears as carbonate in the urine. The same is the case with most of the vegetable salts.

Children who have had rheumatism sometimes suffer from uric acid in the urine, and in such cases the diathesis will require careful attention. The exhibition of water as a therapeutic agent is of great use in these cases, helping to keep the uric acid in solution, and to make the urine copious and pale. If a small quantity of urine is passed daily in a concentrated form, it rapidly becomes thick, and uric gravel is deposited. This deposition of uric gravel in children is of common occurrence, and, according to Dr Garrod, it often depends on the deficient amount of water excreted. He relates two cases:

CASE 1. A boy, 5½ years of age, passed 16 fluid ounces of urine in twenty-four hours, specific gravity 1031. Five ounces of water given an hour before breakfast, and late afternoon meal, increased the urine to 24 fluid ounces, the specific gravity fell to 1017, and no uric acid could be detected. In a few days the quantity was increased to 37 fluid ounces, and the specific gravity fell to 1013.

CASE 2. A girl, 11 years of age, "had the same condition of urine, red gravel being constantly present." The daily quantity of urine passed was 24 fluid ounces, specific gravity 1026. By the same treatment it was at once increased to 45 fluid ounces, specific gravity 1015; in a few days it was 46 ounces, specific gravity 1013, the urine remaining free from red crystals.*

The deposition of uric acid in the renal organs, may, to a great extent, be prevented by the employment of lithia salts, freely diluted.

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* Garrod, op. cit., p. 705.

When a stone has formed, the child must be handed over to the surgeon. The *symptoms of stone in the bladder* in children are the same as in the adult—frequent desire to pass water, which is voided with painful efforts, and is sometimes mixed with blood; occasional stoppage of the stream, and a sore and elongated prepuce from the child's hands being constantly applied to it. Prolapsus ani, accompanied with marked dysuria, is often the first symptom of calculus in children.

Calculi, though frequent in boys, are very rarely found in female children. Hence, when morbid vesical symptoms occur in little girls, the probability of the presence of a stone in the bladder must not be overlooked on account of its rarity. In the autumn of 1877 a girl, nine years of age, came under my care in the Samaritan Hospital. Her mother stated that she had been subject since birth to incontinence of urine, and for more than six months before admission she suffered from dysuria, with constant desire to pass water. On the day of admission the labia were swollen, and the clitoris was large and tender. A few excrescences, neither vascular nor painful, existed around the meatus urinarius. The urine contained a trace of albumen, and there was a scanty deposit of pus-cells. Suspecting the presence of a calculus, I asked my colleague, Mr Alban Doran, to sound the patient under chloroform. He discovered a large stone, and two days later removed it through the urethra, which he enlarged by means of the dilator, invented by the late Professor Simon, of Heidelberg. The stone weighed 2½ drachms, and consisted of a nucleus of uric acid, coated with oxalate of lime. The patient was enabled to retain her urine and to pass it at will the following day. She made a good and rapid recovery.

Within a month after this patient was discharged, a delicate girl of ten was admitted also suffering from incontinence of urine and occasional dysuria. There was a distinct history of calculus in the family, her maternal uncle having been operated on for stone when a youth. A sound was introduced into the bladder under chloroform, but no calculus could be detected. The mucous membrane of the bladder was rough at one or two points. The inguinal and the whole line of iliac and lumbar glands were much enlarged, but the abdominal walls were flattened, and none of the solid viscera had increased in size. On examining her urine two days after the sounding it presented many of the qualities it did on admission; it was very acid, and deposited a large amount of mucus. Under the microscope, a great number of crystals of oxalate of lime were detected. She recovered completely under rest and antistrumous remedies.

Dr W Roberts* and others have shown that although *oxaluria* is most frequent in nervous and debilitated young people, it is not accompanied with definite symptoms, since in many cases it may exist to such an extent as to produce the characteristic mulberry calculus, without any constitutional symptoms, until the stone has mechanically caused vesical irritation.

Hæmaturia or hæmorrhage from the kidneys in children may be met with in tuberculosis, scarlatina, purpura, and some other diseases in which the blood has undergone changes in its composition. A case of acute hæmaturia is recorded in a girl of nine, in which sudden hæmorrhage followed the disappearance of severe pustular eczema on the face and body, of two years' duration.† I have given details of a very interesting case of "Paroxysmal or intermittent hæmaturia in a young child, following supposed injury."‡ A case is recorded in a boy of 12, who passed blood in his urine after falling into a stone basement, a distance of about eight feet. There was pain in the right side. The injured kidney was removed by a lumbar incision, and found to be almost completely torn across. Death took place on the fortieth day after the injury, and was due to pyelitis and circumscribed suppuration of the left kidney, probably due to the retention of the putrid blood-clots in the bladder. These coagula had been, it is true, removed by lateral cystotomy after their presence had been ascertained.§

The treatment must be in accordance with the disease which has originated the symptoms. Gallic acid in five-grain doses, three times a day will be found beneficial, and if there is anæmia, the tincture of the perchloride of iron is a good styptic and diuretic at the same time. Quinine may be sometimes prescribed with advantage. If there are any evidences of renal congestion, rest in bed and a milk diet will be necessary.

Tubercle of the kidney is seen in cases of general tuberculosis, one kidney being generally affected. The organ is increased in size, and converted into a soft, cheesy, yellow mass. Any treatment is unsatisfactory.

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* 'Urinary and Renal Diseases,' 1876.

† 'Brit. Med. Journ.,' 1878, vol. ii, p. 877.

‡ 'The Lancet,' vol. ii, 1880, p. 336.

§ "A Case of Nephrectomy for Rupture of the Kidney," 'Med. Chir. Trans.,' 1883.

Cancer of the kidney is a rare disease, and when present, is of the medullary character.[*] I have had no experience of the affection, but authors describe the symptoms as beginning with pain in the region of the kidney, frequent micturition, and the presence of blood and albumen in the urine. It is extremely doubtful whether cancer-cells have been seen in the urine. "The most important symptom is a generally uneven, nodulated, immovable tumour, sometimes as large as a child's head, reaching from the false ribs to the crest of the ilium, and inwards to the vertebral column, and occupying a considerable part of the abdominal cavity" (Steiner).[†] The children become cachectic and sallow, and finally die exhausted. Sir Spencer Wells has recorded a most interesting case of *soft cancer of the right kidney* in a girl only four years of age. "The diagnosis in this case was made without much difficulty, although the urine was quite normal. The growth was extremely rapid; hardly six months from its commencement to its fatal termination, when the diseased mass weighed between 16 and 17 lbs. The tumour occupied the whole of the right side of the abdomen, bulging backwards in the right loin. It was uniformly elastic, but no fluctuation could be detected. The intestines were pushed downwards, and to the left side. The rapid growth, and the absence of fluctuation, were, of course, strongly against the opinion that the tumour was ovarian; while the rarity of ovarian disease in young children, and the comparative frequency of renal encephaloid, led to a diagnosis which was confirmed by a puncture with a fine exploring needle. A few drops of reddish serum were obtained, containing nucleated cells of various size and shape. I sent the child home, with a note to Dr Williamson, of Nantwich, expressing my opinion that the tumour was a mass of soft cancer, and that the right kidney was the most probable seat of the disease. This proved to be correct. Dr Williamson sent me the specimen, and I exhibited it at the Pathological Society in December, 1862.[‡] The whole kidney was infiltrated with encephaloid. Although so enormously enlarged, the shape of a normal kidney was distinctly preserved. Its surface was soft and elastic, in some spots giving a sense of deep-seated fluctuation, but no cyst was found, nor were there any marks of suppuration or hæmorrhage. Coils of small intestine adhered to its inner and under surface. The ureter was completely occluded by the pressure of the tumour. The left kidney was quite healthy. Thus the normal condition of the urine was explained. The diseased kidney added nothing to the contents of the bladder, and the healthy kidney supplied only normal urine."[*]

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[*] "In the Children's Hospital at Prague in 100,000 cases it was only seen four times."—*Steiner on Diseases of Children*, by Lawson Tait, 1874, p. 279.

[†] "In 16 children its average weight was 8¼ lbs.; the smallest was 1 lb. 9 oz., and the largest 31 lbs."—*On Urinary and Renal Diseases*, by Dr W. Roberts, 1876, p. 523.

[‡] 'Trans. Path. Soc.,' vol. xiv, p. 179.

Hydronephrosis—dropsy of the kidney.—This disorder is caused by an obstruction to the escape of urine from the kidney. The pelvis of the kidney becomes dilated into a pouch or bag, and the renal substance atrophied or absorbed. Sometimes it is divided into smaller compartments or cavities. The tumour may attain enormous dimensions, and fill the abdomen as a soft fluctuating mass. In women it has been mistaken for an ovarian cyst, and tapped under that impression. One or both kidneys may be affected.[†]

"Of 52 cases collected by me the hydronephrosis was confined to one kidney in 32 instances, and affected both (double hydronephrosis) in 20 cases. When the hydronephrosis was single the right side was more frequently affected than the left (19 right and 13 left)."[‡] Of these 52 cases, "there existed congenital malformation in 20 cases, affecting the kidneys, the ureter, and the renal artery. . . . In 13 out of the 20 congenital cases the hydronephrosis was double, that is, it affected both kidneys. Two of these perished stillborn, 1 lived six hours, 1 thirty, and one 36, whilst 1 died twenty days, and another between three and four months after birth."[§]

The contents of these cysts consist of watery urine, uric acid, and the earthy salts, but blood, pus, and epithelium may be also present. Death may occur suddenly from uræmia. In some cases of congenital hydronephrosis urea is absent. A very interesting case is recorded by Mr Henry Morris to prove that urine is freely secreted during intra-uterine life, and that a considerable quantity which the bladder and ureters cannot hold is passed into the sac of the amnion, in which the child floats. Urea appears to be in very small proportion (5 in 1000).[||]

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[*] 'Diseases of the Ovaries,' 1872, p. 203.

[†] See Chap. XXV.

[‡] 'Renal and Urinary Diseases,' by Dr Roberts, 3rd edit., 1876, p. 487.

[§] Ibid., p. 490.

[||] 'Case of Congenital Hydronephrosis,' Royal Med. and Chir. Soc., May 13, 1876.

Hydronephrosis is found to be caused by the impaction of a stone or calculus in the ureter, which causes inflammation and contraction; an imperforate urethra is another cause. A pelvic growth, by compressing the ureter, may prevent the escape of the urine. In some obscure cases no mechanical cause can be ascertained to account for the condition.

An interesting case is recorded by Mr Croft, in a boy, 12 years of age, who was admitted into St Thomas's Hospital under his care, on June 3rd, 1880. The day before, whilst jumping over another boy's back, he fell and hurt his left side and loin. Pain in the back and hæmaturia followed. He was kept in bed and an icebag applied to his side. Blood disappeared from the urine on the 6th day; on the 14th day he was convalescent, there was no tumour in the side, and he went home. Twenty-two days after leaving the hospital, and forty-nine days after the accident, he was re-admitted with a painful and fluctuating swelling in the left lumbar and hypochondriac regions, extending to the epigastric and umbilical regions. He became drowsy, his pupils were dilated, and he could not see clearly. The aspirator was now had recourse to, and by October 15th, he had undergone eight tappings, rather more than three and less than four pints being drawn off each time. The fluid was like clear urine, and contained no blood. On the last occasion it was highly albuminous. No further collection took place, and the patient recovered completely, the cure being brought about, in Mr Croft's opinion, by atrophy of the left kidney, and obliteration of the cavity.*

The *symptoms* depend on the size of the tumour, and the pressure it exerts on surrounding organs. The usual situation of the tumour is in the lumbar region, extending forward to the umbilicus and downwards to the iliac region. The tumour is soft and fluctuating; it is sometimes felt distinctly lobulated, and if of large size there is dyspnœa, and the child cannot lie down without difficulty. The colon generally lies in front of the tumour. When the swelling suddenly diminishes or disappears, coincidently with the escape of a large quantity of urine, we may consider such a sign as pathognomonic. Although not invariably present, it occurs with sufficient frequency to give it the greatest importance in diagnosis.†

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* 'Clin. Trans.,' vol. xiv, p. 107.

† 'On Urinary and Renal Diseases,' by Dr Roberts, 1876, p. 497.

When the symptoms arise from the impaction of a calculus, attacks of nephritic colic and vomiting are not uncommon, with pus and even blood in the urine. If both kidneys are affected, then the elimination of urea is imperfect, and symptoms of uræmia may be looked for. Should the disease be caused by a renal calculus it may be dislodged, and, the sac emptying itself, the symptoms pass away, the sac shrivelling up and causing no further trouble. Peritonitis, septicæmia, or suppuration in the tumour, followed by hectic, may ensue. Impaired health and chronic tuberculosis have also followed.

Treatment.—A milk and fluid diet is preferable to much animal food, as it is important to keep the urine free, and to avoid the accumulation of fæcal matter in the bowels. When there is constipation, a warm-water enema, or a mild non-irritating aperient, will be called for. In the case of a little girl under Dr Roberts's care, friction and shampooing the tumour resulted in the escape of a large quantity of urine, and the swelling subsided. Other cases are recorded where the tumour has suddenly disappeared after a profuse discharge of urine through the ureter and bladder. If this does not occur, and the patient's rest is broken from pain and want of sleep, tapping may be had recourse to as a means of temporary relief. In October, 1879, a girl, seven years of age, was admitted under my care into the Dorset Street Branch of the Samaritan Hospital, suffering from abdominal tumour, which had been known to exist since she was two years old. The case was seen by my colleagues, and variously diagnosed as hydatid, ovarian, and renal. Mr Knowsley Thornton, holding the latter opinion, advised and performed exploratory and antiseptic tapping, and drew off six and a half pints of slightly albuminous urine. The cyst refilled, and the diagnosis being now certain, Mr Thornton removed the cyst by laparotomy on January 2nd, 1880, securing the renal vessels with fine carbolised silk, and using all details of Lister's method. Some congestion of the other kidney, with hæmaturia, followed the operation, but passed off in a few hours, and the child recovered rapidly, and four months afterwards was in perfect health. The cyst was shown as a fresh specimen at the Pathological Society, January 6th, the child at a meeting of the Royal Medical and Chirurgical Society, March 9th, 1880, when nephrectomy was under discussion, and full details have been published by Mr Thornton jointly with myself.*

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* 'The Lancet,' vol. i, 1880, p. 870.

Enuresis (incontinence of urine).—This common disease in children is generally difficult to cure, and the closest investigation frequently fails to discover the true cause. It is met with in the progress of disease of the bladder and brain, and from deficient power in the tone of the bladder and sphincter, in weakly and strumous subjects. "We can sometimes trace the affection to spinal irritation; and the worst case of the disease I ever saw was in a girl affected with diseased spine."* It may originate from gastro-intestinal disorder, ascarides in the rectum, and an excess of uric acid in the urine. When these sources of irritation are removed the patient gets well. But incontinence of urine, among children in too many instances, appears to arise from no mechanical or inflammatory condition of the bladder or kidney, and from no unhealthy state of the urine. We know that the child wets the bed, but neither the parents nor the physician can always assign any reason for it. A long prepuce would seem to be a frequent cause. A very obstinate case under my care, which had resisted all drugs, was cured on its removal. Children who are put to bed without emptying the bladder, often wet the bed at night, and when the habit is once established it is difficult to overcome. In some children the absence of control over the bladder occurs only at night, and in others during the daytime also; in some cases there is almost a constant dribbling, and the child is wet and excoriated, whilst in other cases the desire to pass water is very frequent, and he cannot hold it for a moment when once the desire to pass it has commenced. Boys suffer far more frequently than girls. It may be again urged that the condition of the urine may increase its irritating qualities, especially acid conditions. In such cases, a comparatively small quantity of urine in the bladder may excite reflexly the relaxation of the sphincters.

Incontinence of urine commonly depends upon an abnormal condition of the bladder centres situated in the lumbar portion of the cord.

In normal micturition, the sensation of fulness in the bladder is received by the centre in the cord, until it excites an efferent impulse to the sphincter, which relaxes and permits the contents of the bladder to escape. In early infancy this does not excite consciousness; then the micturition is involuntary, and purely reflex. About the period of the completion of the first dentition, or even earlier, a child ordinarily becomes conscious of the call to void urine, and intimates the desire to its nurse. The relations of the call to consciousness have become established. These relations never become lost again ordinarily, except in very advanced life, or in disease of the spinal cord. Under other circumstances the relations of this call to consciousness do not become perfectly established. In the majority of cases of nocturnal incontinence, during the period of wakefulness, the little patient is conscious of the call, but during sleep the reflex action goes on without exciting consciousness. In more aggravated cases the call does not excite the attention, and the incontinence occurs during the waking state, as well as during sleep.

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* Holmes' 'Surgical Treatment of Children's Diseases,' 1868, p. 581.

Prognosis.—This is hopeful. for as the child grows older he gains strength. Incontinence of urine usually ceases at puberty, when the spinal centres become perfectly developed. The disease is never fatal.

Treatment.—From what has been written concerning the causes of enuresis, the treatment will have to be adopted accordingly. The patient should lie on a hard bed, and strict attention be paid to hygienic rules. As bedtime approaches, the quantity of fluid should be limited, and two or three hours after falling asleep the child should be awakened to pass water, and the same thing should be repeated during the night, that the bladder may not get too full. He should be prevented from lying on his back, and for this purpose a handkerchief tied round the waist, with a knot over the spine.

If the urine is high coloured and there are urates, it must be put into a healthy state, but if it is clear and throws down no deposit, the extract of belladonna (gr. $\frac{1}{6}$ to gr. $\frac{1}{2}$) three times a day is a drug we ought to employ. It is frequently effectual when given in proper doses, and continued for a sufficient length of time. If the fauces become dry and the pupils are enlarged and no improvement follow these physiological effects, the drug must be omitted, and some other substituted. Should, however, the least favorable change be noticed, the belladonna ought to be persevered with, as many cases of enuresis are controlled by its steady continuance, and the patient seems cured. The disease is apt to recur from various causes, as cold, indigestion, or nervous disturbance. Some children grow out of the disorder as they become stronger.

In belladonna poisoning there is paralytic retention of urine, consequently in these cases of hyperæsthesia of the bladder centres belladonna is useful.[*] In those cases where no abnormal source of irritation can be discovered it is well to give belladonna. In many cases this drug will effect a cure, but it should be given in full doses, and all young creatures, including human beings, bear comparatively larger doses of this agent than are required in the case of adults. A ʒiss or even ʒij of the tincture has been given before success was attained.[†] In many cases it is well to add bromide of potassium to the belladonna.

If the condition seems to depend on debility, the tincture of the perchloride of iron, with or without strychnia, will be found of service—five minims in a little water three times a day has often proved of great benefit in my hands. The mineral acids, too, are sometimes serviceable. Cold sponging to the loins and lower part of the back in the early morning are useful measures, and in very obstinate cases a blister to the sacrum. "Another local application, which is very energetic, and in obstinate cases ought certainly to be employed, is the cauterisation of the neck of the bladder. Either the stick-caustic should be used, or a solution of ten grains or even more to the ounce. I prefer the former. But it is a very painful application and not free from danger, and should never be employed till after the failure of general treatment."[‡] I have applied to the urethra, a solution of nitrate of silver (℈j ad ℥j), with very encouraging results. The patient, a nervous timid girl, ten years of age, had suffered from incontinence of urine from birth, and the treatment hitherto employed had been unsuccessful. The incontinence took place during the night, as well as the day, and the mother said "her child's clothes were always wet." I used a small uterine sound, and twisted round the top of it a piece of cotton wool, well saturated with the solution. This was passed along the urethra to the neck of the bladder, and then quickly withdrawn. The application caused no pain at the time, nor any subsequent inconvenience. At the end of a week, the patient had only wetted the bed once; at the termination of a fortnight, twice; and on both these occasions the incontinence was nocturnal. I should state that as the urine was high coloured and rather acid, I prescribed a mixture of belladonna and bicarbonate of potash, but the good effects were, I believe, largely attributable to the caustic application, as the child had been under the care of several medical men, who had, no doubt, employed the usual remedies.

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[*] 'A Treatise on Therapeutics,' by H. C. Wood, M.D., 1876, p. 232.

[†] 'A Guide to Therapeutics,' by R. Farquharson, M.D., 1877, p. 223.

[‡] Holmes, op. cit., p. 584.

In some cases of imperfect development of the cerebro-spinal system, this incontinence of urine is best treated by strychnia, a well-known stimulant to the spinal centres; in other cases there is a hyperæsthesia of the bladder centres in the cord, and then a sedative like bromide of potassium is indicated; in some cases, other different sensations than those of a full bladder are received by this centre, and under what may be called a misconception, the efferent impulse is sent off to the sphincter to relax, and the contents of the bladder escape. In such case, careful search for every possible source of such irritation must be instituted, and, if possible, be found and removed. Without that, all treatment is futile.

According to Dr Herbert Tibbits, incontinence of urine in children has yielded to faradization after every other sort of treatment had failed. One sponge should be applied over the symphysis pubis, and the other to the sacrum and perinæum alternately.*

Sometimes enuresis arises from a long prepuce, and when this is the case there is nothing to do but to remove it. A boy, aged six years came under my care, in 1871, suffering from incontinence, which was perpetually troubling him during the day, but not at night. The prepuce was very long, and the child perpetually put his hands to it, which kept up the irritation. The tincture of the perchloride of iron was given without relief. Hydrate of chloral, in five-grain doses every night at bedtime, caused temporary improvement, but he soon grew worse than ever. Large doses of belladonna kept the disease in check for three weeks, and then the symptoms returned with their former severity. The removal of the prepuce completely cured him.

A chronic case of incontinence of urine is recorded by Mr Teevan, in which a perfect cure was brought about by an operation.† A boy, 12 years of age, had suffered from nocturnal incontinence from birth, and all medical treatment, including iron and belladonna, had been unavailing. On the 11th of February, 1876, when Mr Teevan saw him first, the urethral orifice was "not much bigger than a pin-hole," and there was, in addition, "a small blind internal fistula situated just above the sphincter." The sphincter was divided, and the floor of the meatus externus incised. Six weeks afterwards the cure was complete and permanent.

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* 'A Handbook of Medical and Surgical Electricity,' 1877, p. 215.

† 'Practitioner,' Oct. 1, 1876.

Acute cystitis is sometimes met with in children either from injury, or the irritation of stone in the bladder. It is also said to arise from cold, and to occur during the course of febrile affections. The mucous membrane of the bladder is injected and swollen, and pours out considerable secretion. In the chronic form, mucus and pus are freely poured out. The symptoms are straining in passing water, followed by a few drops sometimes mixed with blood; pain over the pubis and weight in the perinæum. In a case of simple acute cystitis which came under my notice in Nov., 1876, the desire to pass urine was frequent, and very painful. The patient was a girl ten years of age, and no cause could be discovered to produce it. There was no indication of stone or other mechanical cause. The urine was never albuminous, but frequently high coloured and turbid, and this was the only explanation that could be offered. Under the influence of rest in bed, and a milk diet, with a mixture of citrate of potash, the symptoms passed off in about a fortnight, the urine never becoming ammoniacal or alkaline.

Treatment.—This consists in confinement to bed, and the employment of warm hip-baths at bed time, if micturition be frequent and painful. A linseed-meal poultice should be employed over the loins, or lower part of the abdomen, if there be much pain. A demulcent mixture of mucilage and liquor potassæ, with or without opium,[*] is useful to allay pain and irritation which the acid urine excites. In some cases, tincture of belladonna with citrate of potash is even more efficacious. As a mild and efficient purgative there is nothing better than castor oil. The diet must be simple and no stimulants of any kind should be given. Milk-and-water, or milk in soda water, are the best forms of nourishment. If milk is strongly objected to, then weak veal or chicken broth, and barley water must be substituted. In this respect, the diet and treatment generally are closely akin to that recommended for the uric acid diathesis.

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[*] Form. 45:

℞ Liquor. Potass. ʒj
— Opii Sed. ♏viij
Mucilag. ℥ss
Mist. Camph. ad ℥iv. M.

A tablespoonful every four hours.
For a child of eight or ten years old

CHAPTER XXIII (*continued*)

DISEASES OF THE KIDNEYS AND URINARY ORGANS

DIABETES—*Varieties of*—1. DIABETES MELLITUS—*Symptoms—Causes—Tests for sugar in the urine—Pathology—Prognosis—Treatment.*—2. DIABETES INSIPIDUS, OR SIMPLE DIURESIS—*Symptoms—Causes—Pathology—Treatment.*

DIABETES MELLITUS is recognised by a large increase in the urinary secretion, owing to the presence of sugar. The complaint is not frequent in adults, and in children it is exceedingly rare, particularly under five years of age. It is not alluded to by Tanner, or Meigs and Pepper, Vogel, or Lewis Smith. Dr West mentions one case as having come under his observation, in a little girl three and a half years of age, whose brother at two years, and whose sister at two and a half years, died of the same disease.* Out of a total of nearly 700 cases, Dr Prout only saw one instance in a child of five, and about a dozen cases between eight and twenty years of age, four of whom were females.† Dr W. Roberts met with it in a boy of three years, and he mentions the singular fact that as many as ten deaths from diabetes under the age of one year are recorded in the Registrar-General's Report for 1851—1860.‡

Symptoms.—These are gradual in their onset, the disease being generally of some weeks', or even months' duration before it is discovered. Failing strength and gradual loss of flesh, notwithstanding an excessive appetite, excite suspicion that the patient is going wrong. Then the frequent calls to pass urine in immoderate quantities, and the insatiable thirst soon clear up the nature of the malady. It is worthy of notice that there may be urgent thirst before the renal secretion is increased. The urine is of a light straw colour, and has the odour of new-mown hay; it is more or less saccharine in taste, and of high specific gravity, reaching 1030 to 1050, or even 1060. In this respect it differs from albuminous urine, and that of *diabetes insipidus.* It should, however, be borne in mind that the specific gravity of saccharine urine may be low. Prout mentions a case where it was as low as 1010,[*] and Dr W. Roberts says it may sink to 1015.[†] There appears to be an antagonism between diabetes and gout, the latter ceasing on the supervention of the former in adults.[‡]

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* 'Diseases of Infancy and Childhood,' 1859, p. 655.

† 'Stomach and Renal Diseases,' 1848, 5th edit., p. 36.

‡ 'Urinary and Renal Diseases,' 1876, p. 221.

As the complaint advances, the symptoms increase in severity, the thirst becomes greater, and the appetite is excessive; the patient rapidly loses flesh and strength; the skin is dry and harsh; the tongue clean and flabby, or red and aphthous; digestion is deranged, and pain or sinking at the stomach is often present, with more or less flatulence, or even vomiting; the bowels are constipated and the mind is depressed. In some cases there is sweating at this stage, and even attacks of diarrhœa. Inflammatory complications of the pleura and peritoneum may supervene, and later on symptoms of pulmonary phthisis, with diarrhœa and hectic. Phthisis is the most frequent termination according to Prout. The urine now diminishes in quantity, the legs become œdematous, and death usually occurs from exhaustion. In some cases death takes place from coma.

Causes.—The disease appears to prevail chiefly in families that are phthisical or epileptic. Dr W. Roberts alludes to a family of eight children who all became diabetic, though the parents were healthy,[§] and instances are mentioned in which it has appeared through the third and fourth generations. The exciting causes are probably exposure to cold and damp, drinking large quantities of fluid when the body is heated, excessive use of saccharine articles of food, febrile diseases, and mental emotion. "Glycosuria has been repeatedly observed in cases of pneumonia, whooping-cough, and phthisis, which lead to deficient oxygenation of the blood."[‖] Some disturbance in digestion and assimilation appears capable of originating it, the kidneys take on excessive action followed by the usual symptoms.

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[*] Prout on 'Stomach and Renal Diseases,' 1848, 5th edit., p. 25.

[†] 'On Urinary and Renal Diseases,' 1876, p. 226.

[‡] 'Lectures on Diseases of the Liver,' by C. Murchison, M.D., 1877, p. 559.

[§] Op. cit., p. 223.

[‖] Op. cit., p. 558.

Diabetes is sometimes of traumatic origin, following injury to the brain or spinal cord.

The chief tests for sugar in the urine are three:—

1. *The copper test* (Trommer's test). Put some of the suspected urine in a test-tube, to which add a drop or two of a solution of sulphate of copper. Liquor potassæ to the extent of half the volume of urine is then added, and the mixture boiled. If sugar is present, a reddish deposit of the suboxide of copper is thrown down. When there is no sugar the precipitate consists of black oxide of copper.

Fehling's solution is a more delicate test than the preceding. Boil a small quantity of the solution in a test-tube, and then add a few drops of urine. If there is much sugar present, a yellowish-brown precipitate of oxide of copper will be thrown down. When no change results from boiling an equal quantity of urine and the solution, there is no sugar present. Pellets containing the constituents of the cupric test, introduced by Dr Pavy, are convenient, and form both a simple and reliable test.

2. *Moore's test.*—An equal quantity of urine is to be boiled with liquor potassæ in a test-tube, when, if sugar be present, the mixture will assume a dark brown-brandy colour. There is some objection to this test, as the same proceeding slightly darkens healthy urine. "Again, all high-coloured urines of high density become darker when boiled with liquor potassæ, although free from sugar, and albuminous urines, even when not high-coloured, darken sensibly under the same treatment."*

3. *The fermentation test.*—A little German yeast is to be put into a test-tube, and then filled to the top with the suspected urine. The tube is now to be inverted in a dish or saucer, and put in a warm place, or in a temperature of 80°. The urine begins to ferment, and carbonic acid gas is seen collecting at the top of the tube, and if there is a large quantity of sugar, all the urine is driven out before it. According to Dr Roberts, this is a less sensitive method of sugar-testing than Moore's plan.†

Another plan is to take two glasses of urine, to one, add German yeast, and put both aside in a warm place for twenty-four hours; then take the specific gravity of each, the difference will indicate the number of grains per ounce.

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* 'On Urinary and Renal Diseases,' by W. Roberts, M.D., 1876, p. 183.

† Op. cit., p. 183.

Pathology.—Claude Bernard, in 1848, stated that sugar was secreted by the liver in health, and that if the eighth pair of nerves were irritated at their origin in the fourth ventricle, an abnormal quantity of sugar is produced in the liver. The sugar so formed was supposed to be carried to the heart by the hepatic veins and vena cava, thence it was conducted to the lungs by the pulmonary arteries, and combustion taking place the sugar was consumed. Further researches have tended to show that it is glycogen, not sugar, that is formed in the liver; but glycogen is a product so readily converted into sugar, that as far as the pathology of diabetes is concerned, the distinction is not important.

When the sugar formed in the process of digestion is in excess of the capacity of the liver to dehydrate into glycogen, then it appears in the urine. Or in cases where oxygenation is defective, and the sugar found in the liver and muscles is consequently not burnt off, then also it appears in the urine. We therefore get glycosuria as the consequence of derangement of the digestive act, or in diseases where the blood is imperfectly oxygenised. Further, "whatever quickens the circulation of blood through the liver, particularly in the hepatic arteries, favours the conversion of glycogen into sugar, possibly by increasing the amount of albuminoid ferment; and, accordingly, whatever paralyses the vaso-motor nerves of the hepatic vessels, either directly or indirectly, dilates these vessels, produces an increased flow of blood through them, and so leads to diabetes.*"

Prognosis.—This is very unfavorable, the disease being fatal in the greater number of cases, and the younger the child the greater is the fatality. The duration of the disease is variable. It usually lasts from one to three years. Dr W. Roberts saw a child of three years, who died in three weeks, and Becquerel a boy of nine years, who died in six days.† If sugar persists in the urine when the patient is restricted to a purely animal diet, it is of evil omen.

Treatment.—This, as in adults, mainly consists in regulating the diet, so as to prevent the accumulation of sugar in the blood, for on this depends the excessive thirst, the inordinate appetite, and the emaciation. All food, therefore, containing sugar, or articles convertible into it, should be avoided, especially bread and potatoes, rice, tapioca, and arrowroot—indeed, all matters rich in starch.

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* 'Lectures on Diseases of the Liver,' by C. Murchison, M.D., 1877, p. 558.

† 'Urinary and Renal Diseases,' 1876, p. 281.

Such vegetables as turnips, cabbage, broccoli, carrots, parsnips, peas, asparagus, and seakale, must also be avoided. Endive, watercress, lettuce, and celery, may be taken. Sweet fruits, as apples, pears, oranges, and currants, fresh or preserved, are deleterious. Animal food is chiefly to be relied on, as bacon and ham, fish of every kind, butcher's meat, poultry, game, broths, and soups. Eggs dressed in any form, cheese, butter, cream—indeed, every form of fat may be taken. Bran cakes, made after the formula of Dr Camplin, are very serviceable. They are entirely free from starch, consisting of bran, eggs, butter, and milk. Gluten bread and biscuits, prepared by Van Abbott, Princes Street, London, and similar bread of other well-known firms, is to be recommended. There are also almond rusks and buscuits, introduced by Dr Pavey, and made by Mr Blatchley, Oxford Street. These may be taken in change with other suitable forms of diet.

Dr A. S. Donkin relates the case of a girl, ten years of age, who was successfully treated by the skim-milk method. The urine ranged from 1040 to 1045. There was great thirst, excessive appetite, polyuria, and great loss of flesh. A restricted meat diet, iron, and Dover's powder at night, failed to do good, but when the patient was placed on a skim-milk diet, the specific gravity of the urine fell to 1016 within a week, and on the thirteenth day of the treatment, it fell to 1012, and not a trace of sugar could be detected. In little more than six weeks she had gained five pounds in weight. The author considers from this case and others under his care, that diabetes is curable in childhood and early life, when the disease is recognised early and the constitution good.*

Glycerine should take the place of sugar, and in combination with dilute phosphoric acid it allays thirst. Tea and coffee without sugar are suitable.

The patient should drink enough water, and no more, than to allay thirst, and lemon juice may be added to it.

Exercise in the open air, short of fatigue, is important.

Drugs have little or no influence over the disease, the only means that hold out any hope of cure being great care in diet. In the experience of many physicians, opium, however, is a remedy which, when given in large doses, reduces the quantity of urine. It seems to have the power of diminishing the appetite and thirst, and of inducing sleep, and allaying irritability. Some physicians have a preference for codeia; it is equally effective and less constipating. Dover's powder is perhaps the best form for giving opium, as it lessens the secretion of urine, and equally subdues irritation and restlessness. Alkalies, arsenic, bromide of potassium, lactic acid, and peroxide of hydrogen are all useless. A powder of bicarbonate of soda and rhubarb, or castor oil, by correcting the secretions and relieving constipation, will be advisable from time to time. The bowels require to be kept free, but purging is objectionable. Iron may possibly retard the progress of the disease for a period, where the patient is anæmic. The best forms for administration are the ferri et ammoniæ citras, the tincture of the perchloride, or the solution of dialysed iron. Cod-liver oil, too, is useful to support the strength.

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* 'Clinical Transactions,' vol. ix, p. 39.

The clothing requires to be warm, and flannel should be worn next the skin. A residence at the sea-side, or even sea-bathing will be advantageous in some cases. The best foreign watering-places are Carlsbad and Vichy.

Finally, all those hygienic measures ought to be carried out which naturally suggest themselves where the kidneys are doing excessive work.

Diabetes insipidus—simple diuresis is characterised by great thirst and excessive discharge of pure limpid urine, of low specific gravity (1003 to 1007), containing neither sugar nor albumen. In a table of seventy cases given by Dr W. Roberts, seven occurred in infancy, and fifteen from five to ten years. In two or three of the cases the disease existed at birth.* It is not so fatal as the saccharine form of diabetes.

As in *Diabetes mellitus*, the complaint would seem sometimes dependent on gastric and intestinal disturbance, but in a large proportion of cases no cause can be ascertained. Exposure to cold, by checking the action of the skin, and throwing more work upon the kidneys, has originated the complaint; drinking large draughts of cold water, violent muscular exertion, cerebral tubercle, febrile diseases, blows and falls, syphilis and hereditary influences, appear to be among the most frequent causes. The exact cause has been attributed to some change in the renal capillaries, which allows of an increased quantity of watery fluid being separated from the blood, just as happens in a hysterical paroxysm. Dr Handfield Jones considers that the Malpighian capillaries are more affected than those of the tubular plexus.[*] Some authorities consider the disease neurotic.

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* 'On Urinary and Renal Diseases,' 1876, p. 198.

Symptoms.—These may be gradual, the disease having lasted from infancy to maturity in some cases, or it may come on quite suddenly. "In two cases the symptoms commenced immediately after violent muscular effort. One was a boy of twelve, who strained himself in pushing a cart wheel sunk in the mud."[†] The urine is colourless, and containing a very small proportion of solid constituents, having a specific gravity nearly as low as water itself, 1003 to 1007; it is of acid reaction, but quickly becomes neutral or alkaline, and undergoes decomposition. The skin is generally harsh and dry, and the thirst intense, arising no doubt from the greater quantity of urine passed than in saccharine diabetes. The general health is often wonderfully preserved, notwithstanding that the disease may have existed from an early period of life. Dr W. Roberts mentions the fact of a boy of ten years of age under his care, being well nourished and in good health, though he passed fifteen pints of urine daily for several months.[‡] In most instances, however, symptoms resembling those met with in *diabetes mellitus* are present; there is loss of flesh, thirst, voracious appetite, heat and dryness of the skin, pains in the limbs and loins, and irritability of temper. The disease is of uncertain duration, and generally terminates in phthisis or cerebral disease.

Pathology.—After death the kidneys have been found degenerated, and containing very small abscesses. The base of the brain has revealed miliary tubercles in a few cases. "The pathology of *diabetes insipidus* appears to be somewhat similar to that of *diabetes mellitus*, only that the renal vessels are dilated instead of the hepatic ones."[§]

Treatment.—Valerian in large doses is well spoken of by Trousseau and Handfield Jones. In a boy, ten years of age, under the care of Dr W. Roberts, the valerianate of zinc in gradually increasing doses, up to twenty grains daily, reduced the urine from fifteen to five pints a day, and greatly diminished the thirst.[||] Camphor, iron, ergot, and galvanism have been tried with varying success.

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[*] 'On Functional Nervous Disorders,' 1870, p. 790.

[†] Roberts, op. cit., p. 200.

[‡] Op. cit., p. 204.

[§] "Diabetes insipidus," by Lauder Brunton, M.D., 'Reynolds' System of Medicine,' vol. v, p. 420.

[||] Op. cit., p. 215.

Mercury and iodide of potassium have been found serviceable where the disease is of syphilitic origin. The disease, however, can scarcely be considered amenable to treatment. No remedy has been known to cure it, and it has usually a fatal termination. A normal appetite, and the absence of organic complication, may be looked upon as favorable signs.

CHAPTER XXIV

DISEASES OF THE PERITONEUM

ACUTE PERITONITIS—*Symptoms—Causes—Morbid appearances—Diagnosis and prognosis—Treatment.*—CHRONIC PERITONITIS—*Causes and Treatment.*—TUBERCULAR PERITONITIS (TABES MESENTERICA)—*Symptoms—Causes—Consequences—Morbid appearances—Diagnosis and treatment.*—ENLARGEMENT OF THE ABDOMEN.

ACUTE PERITONITIS is a very rare disease in children, the mucous membranes being much more prone to inflammation than the serous in the young. When it is present the symptoms resemble those observed in the adult. In the new-born infant, peritonitis is more common than in later childhood, and syphilis appears to be a frequent cause of it at that early period. There may be constitutional evidence in the hoarse voice and copper-coloured eruption over the body. Rilliet and Barthez met with a dozen cases of acute peritonitis. In about six per cent. of all the infants who died at the Hospice des Enfans trouvés, M. Thore met with acute peritonitis.*

Peritonitis, which is rarely a primary disease, may commence rather suddenly with rigors and shivering; more frequently it comes on gradually in the course of some other disease, with pain in some part of the abdomen, as about the umbilicus or hypogastrium, and from thence it spreads over the whole abdominal region. The slightest pressure is intolerable, not even the weight of the bedclothes can be borne; the child lies on his back with his knees drawn up, to relax the muscles of the abdomen. The face wears an anxious and painful expression, the lips are compressed, and the nostrils active; the breathing is short and thoracic, for as the diaphragm descends on full inspiration, the abdominal pain is increased, but the epigastrium may rapidly rise and fall at the same time. In such cases I have known the respirations to reach 80 per minute. The bowels may be constipated or relaxed, and the urine scanty and high coloured. Occasionally the bladder is paralysed, and the urine has to be drawn off. The tongue is clean, or it has a whitish fur upon it, which soon becomes dry. There is thirst and loss of appetite. The disease may drag on for some days, during which the skin becomes moist and damp, the pulse feeble and fluttering, and there is vomiting of coffee-coloured fluid, besides gaseous distension of the abdomen, torpor of the mental faculties, and death by asthenia is often the result. Sometimes the disease is more limited and circumscribed; it does not extend over the whole abdomen, and yields to the remedies employed.

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* 'Diseases of Children,' Dr Churchill, 1858, p. 592.

Causes.—Peritonitis may arise from cold, wet, fatigue, and bad living. A fatal case is recorded by Mr Jeaffreson, of Newcastle-on-Tyne, of a girl fifteen years of age, from perforation of the rectum with a walking-stick, which her uncle was holding between his legs whilst she was jumping on his knee. A rent was discovered in the anterior wall of the rectum, through which the finger could be passed into the peritoneal cavity. Peritonitis ensued, and death took place within forty-eight hours.* It sometimes occurs as a sequel to scarlatina.

Dr Burney Yeo has related an instructive case of "infective peritonitis" in a boy twelve years of age, complicating an attack of whooping-cough, and terminating fatally. There was pneumonic infiltration of the left lung, and fluid in the left pleural sac. He quotes from 'Ziemssen's Cyclopædia' to the effect, that pus may pass from the pleural cavity through the diaphragm into the peritoneum, and there set up fatal peritonitis.† Several cases have come under my notice in which septicæmia in women, springing from operations involving the peritoneum, has extended to the pericardium and pleural cavities.

Peritonitis has followed inflammation of the cæcum, from the impaction of a foreign body in the vermiform appendix. The disease may terminate in twenty-four hours, or last four or five weeks. It may also follow injuries or operations on the abdomen, as tapping.

The *morbid changes* detected after death, are the effusion of lymph over the peritoneal surface and amongst the intestines; the vessels of the peritoneum and abdominal wall are injected; and there is clear or lemon-tinted serum in the peritoneal cavity or even a thick or thin muco-purulent matter. The spleen and liver may be coated with lymph. In a case related by Dr West, of a boy, nine years of age, a pint of pus was found in the right pleura, the inflammation having extended from the abdomen to the thorax.* This is not an uncommon coincidence.

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* 'Brit. Med. Journ.,' 1874, vol. ii, p. 403.

† Ibid., Dec. 7, 1878, p. 827.

The *diagnosis* from colic has been already given,† but we may repeat that in peritonitis the constitutional symptoms are more severe, the pain is increased on pressure, it is not paroxysmal, and the pulse soon becomes quick and feeble. As the disease assumes a more chronic form, crepitation can often be felt by the hand, when it is laid on the abdomen above the effused lymph.

The prognosis is grave, unless the inflammation is limited in extent and moderate in degree.

Treatment.—Where the patient is strong enough, a few leeches should be applied to the abdomen, and it may be even necessary to repeat them. This requires to be carried out effectually if the case be seen early, and the child is able to bear depletion well. It offers the best chance of relief. Then warm light poultices are very comforting, and they should be frequently renewed. Small doses of calomel, combined with opium or Dover's powder, are also serviceable to allay pain and abate inflammation. Opium is invaluable in peritonitis, and should be given freely. If the bowels are constipated for any length of time, warm-water enemata, and an elastic tube passed up the anus to favour the escape of gas will be advisable. The diet should consist of milk-and-water, thin arrowroot, or weak beef tea, according to the state of the stomach and the strength of the patient.

When peritonitis succeeds scarlet fever the symptoms are less acute, but, owing to the defective elimination of urine by the kidneys, dropsy is very apt to arise.

Chronic peritonitis may be the sequel of an acute attack, or it may arise from the irritation of tubercles in the peritoneum of strumous subjects. The symptoms are abdominal pain and tenderness, with more or less swelling; sometimes crepitation can be felt from the effusion of lymph between the folds of the intestines. If this does not cause fatal obstruction the case may recover, but where the complaint is due to the irritation of tubercle, the mesenteric glands are apt to become involved, febrile disturbance comes on in the evening, food is vomited, and death takes place from phthisis or exhaustion.

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* 'Diseases of Infancy and Childhood,' 4th edit., p. 618.

† See Chap. XV, "On Constipation and Colic."

The *treatment* consists in supporting the general strength by nutritious and easily digestible food, such as milk, raw eggs, cod-liver oil, or malt extract. A blister to the abdomen is sometimes of service.

Tabes mesenterica is a chronic tubercular disease of the mesenteric glands, and is sometimes associated with tubercular peritonitis. Enlargement of the abdomen is the first symptom which attracts notice, and there may be some fluid in the peritoneal cavity. A child may be quite well and strong till he is seized with whooping-cough, or one of the exanthemata, and from that period the disease commences. He gradually loses flesh and strength, and if he has been accustomed to run about he now ceases to do so; he complains of being tired, and wishes to be nursed by his mother. The complaint sometimes commences with looseness of the bowels, the motions being thin and yeast-like, containing mucus or even streaks of blood. Then the abdomen begins to swell, and is tender on pressure, colicky pains are common, and the child will lie on his back in bed with his legs drawn up. He often cries out with pain, and the face is pinched and drawn. On examination, the liver may sometimes be felt below the ribs, and the spleen also. As the case goes on, the abdomen becomes irregular in shape, and in some cases crepitus can be detected when the hand is passed lightly over it, from the effusion of semi-organised lpmph. As the disease advances, an irregular nodular mass may be felt about the umbilicus, or to one side of it. This is frequently found to consist of omentum, mesentery, and intestines glued together, and among this mass there are enlarged mesenteric glands, sometimes the size of a filbert. As the disease goes on, some degree of ascites is present, and the lumbar regions are dull on percussion. Emaciation sets in, there is constant vomiting and diarrhœa, the pulse becomes quick and small, the temperature rises in the evening, and the child dies exhausted or in convulsions. The disease may terminate by bronchial phthisis, pulmonary consumption, or tubercular meningitis.

A knowledge of morbid anatomy will explain this condition. In early life the mesenteric glands are very large and vascular. They are concerned in the elaboration of the chyle after it is taken up by the lacteals and before it is discharged into the blood. If the food given be not sufficiently nutritious, lowly organised products are produced, and such food has a tendency to derange the mucous membrane, and to cause active congestion of the mesenteric glands. The glands can sometimes be felt through the parietes of the abdomen, sometimes they undergo strumous change, or contract into a cretaceous mass when the health is restored.

Disease of the mesenteric glands may lead to intestinal occlusion. In the case of a boy, four years of age, who came under my care at the Samaritan Hospital in 1878,* there was considerable distension of the abdomen, and symptoms of obstruction a few days before death, which was preceded by coffee-ground vomiting, convulsions, and unconsciousness. After death, the intestines and omentum were found glued together in a large mass, and adherent to the peritoneum at the umbilicus and brim of the pelvis.

The *diagnosis* is generally not difficult; the liver is often healthy, and as the disease advances, the belly becomes irregular over its surface, and more painful than in ascites. There is often a fluctuation in the temperature, and the signs of tubercular mischief in other organs, as the complaint advances.

The *treatment* consists in maintaining the general strength and meeting the chief symptoms as they arise, but it is very unsatisfactory. If there is any amount of peritonitis, opium in some shape or other must be given, and linseed poultices be applied to the abdomen to relieve the pain and tenderness. When diarrhœa is very active, a little chalk mixture with catechu or krameria (Form. 31—32) will be necessary, and the diet must consist of rice, milk, and arrowroot. The treatment is much the same as would be employed in chronic diarrhœa. When the bowels are quiet, the syrup of the iodide of iron, and cod-liver oil, if the stomach will retain it, should be prescribed. The hypophosphites are very serviceable.† I have found painting the abdomen night and morning with a weak tincture of iodine (1 in 7) useful, and then applying a flannel bandage. I prefer this to rubbing any kind of ointment into the abdomen. When the child is well enough to be moved, change of air to the seaside will be advisable.

Enlargement of the abdomen is very commonly observed in delicate children who are rickety or of a strumous habit of body, but I have seen it in fairly developed children, who are otherwise healthy. The parents observe that the abdomen is disproportionately large to the rest of the body, and that it becomes very much so after food. In many cases the increased size is chiefly due to flatus in the intestines, to constipation, and improper feeding. The abdominal walls yield and become overstretched; the abdomen is soft, pressure gives no pain, and no tumour can be felt. This condition is sometimes seen with congestion of the liver, and with that condition known as "pot belly." I have noticed it not rarely in delicate children after an acute illness, as whooping-cough or measles. In children brought up by hand, with delayed dentition, it is not uncommon. It arises chiefly from the accumulation of gas in the intestines; a clear tympanitic note is heard all over the abdomen, especially in the left hypochondrium, and in both flanks. The epigastrium is prominent, either from undue distension of the stomach, or of the transverse colon behind it. "The little child's abdomen is large because its abdominal and intestinal muscles are weak, its pelvis is shallow and small, its diaphragm flat, and its liver and spleen large, and because much flatus is formed in its small intestines, especially during the digestive process."[*]

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* 'Lancet,' Aug. 10, 1878, p. 185.

† See Chap. XLIX, "On Rickets."

Enlargement of the abdomen, when seen in connection with tubercular peritonitis, causes pain on pressure; the abdomen is irregular in outline, partly from the enlarged viscera beneath or from semi-organised lymph; the bowels are often very loose, and the belly is painful; the face is pinched, and the child rapidly loses flesh.

The liver may remain very large without any impairment of the general health, a condition we sometimes see in connection with the strumous diathesis and general cachexia.

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[*] "On Extra-pelvic Tumours of the Abdomen," by Sir W. Jenner, Bart., M.D., 'Brit. Med. Journ.,' Jan. 2, 1869, p. 2.

CHAPTER XXV

ASCITES

Causes — Nature — Symptoms — Diagnosis—Treatment—Iron—Saline apperients—Copaiba—Paracentesis.

DISEASE of the liver, by obstructing the portal circulation, is the most common cause of ascites in children, but it may also arise from great enlargement of the spleen, from cirrhosis, from chronic peritonitis, and from tabes mesenterica. The enlarged glands in the latter disease cause friction and irritation of the peritoneum, and so lead to serous effusion. Ascites has been supposed to arise from the pressure of enlarged lymphatic glands on the portal vein near the liver.* It appears to me that cachexia and anæmia are not uncommon causes of this form of dropsy. In the absence of any history of acute illness, and if organic disease be not present, it seems a reasonable inference, that some morbid condition of the peritoneum or lymphatics may favour the secretion of serum into the peritoneal cavity. I have published cases in illustration of these views.† ‡

Dr Hillier has recorded two cases of chronic ascites in children, in which during life the cause was most obscure. The dropsy appeared to be independent of cardiac and renal disease, of tubercle, of cancer, and of peritonitis. A post-mortem examination in one of the cases revealed caseous degeneration of the lymphatic glands, pleuritic and pericardial effusion, and about twenty ounces of fluid in the peritoneal cavity. In a report on the nature of these lesions Dr Burdon-Sanderson regards it as due to chronic inflammation, or "to the growth of round or oval connective-tissue corpuscles and of new fibrous tissue in the affected organs."§

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* 'Brit. Med. Journ.,' Nov. 20th, 1875.

† "Ascites in a young child; treatment by Paracentesis and Copaiba; Recovery," by W. H. Day, M.D., 'Clin. Trans.,' 1877, p. 164.

‡ 'Medical Society's Proceedings,' 1883, p. 387.

§ 'Clin. Trans.,' vol. i, p. 117.

Symptoms.—The abdomen is more or less prominent in proportion to the amount of fluid present. If the distension is great the diaphragm is pushed upwards, and there may be some dulness on percussion, and defective expansion in the lower lobes of the lungs. Over the seat of effusion the percussion note is dull, chiefly heard in the flanks, and more in one flank than in the other, when the patient turns on his side. Along the anterior surface of the abdomen the percussion note is clear, and this varies according to the amount of air which the intestines contain; the higher they float the more tympanitic is the note. The constitutional symptoms are a gradual decline in the general health; the skin is dry, the bowels are usually constipated; the urine is scanty, acid, and high coloured, from the presence of urates, which may be whitish instead of pink; there is often thirst and a voracious appetite. There are exceptions to this; there may be no thirst, no high-coloured urine, but even phosphates whilst the abdomen gets daily larger.

As the abdominal distension increases, the superficial veins become enlarged and tortuous; the child is thin and wasted, the features are pinched, and the nights restless and wakeful. As the disease advances the emaciation increases, a hectic flush appears on the cheeks at night, the pulse becomes rapid and feeble, respiration is accelerated, and death takes place from exhaustion.

The *diagnosis* mainly rests on the primary and uniform swelling in the abdomen without any œdema of the legs, and the absence of swelling in the upper parts of the body; the presence of disease in the liver, and the high coloured, scanty, and non-albuminous urine. As ovarian cysts have been met with in children, this fact should be borne in mind in all cases of doubtful diagnosis. Hydatid cysts of the liver, hydronephrosis, enlarged spleen and mesenteric glands, must also be taken into consideration, and the conditions belonging to each carefully investigated. Where the abdomen is uniformly swollen the probabilities are against these morbid conditions. The chief points of diagnosis in the case of ovarian tumours as distinguished from ascites, are to be found in Sir Spencer Wells' work.*

Treatment.—This to a great extent depends upon the cause. If there is disease of the heart, lungs, or kidneys, these affections must receive appropriate treatment; but usually, however, the mischief is seated in the liver, which we must endeavour to overcome. Whatever may be the cause which has induced the disease the bowels should be kept freely open, and for this purpose the compound jalap powder, given early every morning, is a good remedy to drain off the fluid. Sometimes elaterium is of great service, and may remove the dropsy altogether. It requires to be given cautiously, and the dose regulated according to its effect. I have known gr. 1-30 produce two copious watery motions daily, without faintness or sickness.* When the urine is scanty and high coloured, digitalis and citrate of potash will relieve the congestion of the kidneys, and act as a brisk diuretic. Then the syrup of the iodide of iron is a good tonic, or the tincture of the perchloride of iron may be given. Ascites has over and over again yielded to tonics, and they ought to have a steady and fair trial where the effusion appears to be independent of any organic lesion.† The patients should be well nourished.

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* 'Diseases of the Ovaries,' 1872, p. 125.

If these remedies fail, as they frequently will do, copaiba is an excellent remedy, according to some authorities, acting as a diuretic, and carrying off much fluid by the bowels. In the case just alluded to, I believe its action was that of a general tonic, and not that of a diuretic. It does not disagree with digestion or appetite. Other cases of ascites are recorded which have yielded to the use of copaiba.‡

When the increasing pressure causes pain and discomfort, when respiration is interfered with, and the general health is gradually failing, paracentesis ought to be resorted to. The operation should be performed before the abdomen is excessively distended, and the superficial veins are greatly enlarged; in fact, as soon as other remedies fail to reduce the dropsy. If delayed too long the chances of success are diminished. Dr Austin Flint is an advocate for tapping early, and as often as the dropsy returns.§ The risks from prostration and peritonitis are so small, that these cannot be urged as real objections, and even if the dropsy should return the patient is not in a worse condition. Relief always follows the removal of the fluid, a strain is taken off the vessels, the kidneys act more vigorously, the respiration is no longer embarrassed, and the appetite for food returns. Some cases of ascites would appear to resemble hydrocele in their nature, and to originate in debility, or in some constitutional condition, apart from any glandular or portal obstruction. These cases are probably allied to some simple ovarian cysts, in which a cure often follows a single tapping.

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* Form. 45A:
℞ Elaterii gr. ⅓
Spt. Æther. Nitr., ʒj
Tinct. Hyoscyami ʒss
Syr. Zingib. ʒij
Aquam ad ℥iv.
M. Two teaspoonfuls for a dose in an equal quantity of water.
For a child from 5 to 8 years of age.

† "Cases of Ascites treated successfully with Tonics," by J. S. Bristowe, M.D., 'Clin. Trans.,' 1869, p. 12.

‡ "Cases of Ascites treated with Copaiba," 'Clin. Trans.,' 1870, p. 30.

§ "On Early Tapping in Ascites," 'Brit. Med. Journ.,' 1883, p. 565.

CHAPTER XXVI

INTESTINAL WORMS

Varieties of.—OXYURIS VERMICULARIS, OR ASCARIS VERMICULARIS.—ASCARIDES (THREADWORM).—ASCARIS LUMBRICOIDES (ROUND-WORM)—*Symptoms*—*Causes*—*Treatment.*—TRICHOCEPHALUS DISPAR (LONG THREADWORM).—TÆNIA OR TAPE-WORM—*Treatment.*

THE presence of worms in the intestinal canal is one of the commonest troubles of childhood. Worms produce in some cases an amount of constitutional disturbance and local irritation, which the best observers may be pardoned if they attribute to specific disease.

It is with the two nematodes, *Oxyuris* and *Ascaris*, that we have generally to deal in childhood. The *Oxyuris vermicularis*, or threadworm, has its head-quarters in the cæcum, but frequently descends to the lower part of the large intestine or rectum. Worms infest children, whether living in country districts or in the confined dwellings of houses and cities; but their presence is not necessarily incompatible with previously good health. They are not uncommon in strumous subjects, or in children labouring under chronic disease, in whom the digestive and assimilative functions are at fault—where there is subacute inflammation of the intestinal glands (muco-enteritis). They are often spoken of as "ascarides," since Linnæus placed their species under the genus *Ascaris*. But the term is confusing, as they have long been classified under a separate genus, *Oxyuris*, and must not be confounded with the long worm, *Ascaris lumbricoides*.

In a mass of *Oxyuri*, or threadworms, the majority are females. and appear like little moving pieces of thread, about a quarter of an inch long, with a pointed tail. The males are shorter and keep the anal end of their body more or less coiled up. The eggs are commonly introduced by the habit which children have of biting their nails. They are hatched in the stomach, the larvæ undergoing their subsequent growth and metamorphosis within the alimentary canal.

Symptoms.—The appearance of the parasite in the motions is of course the only pathognomonic sign; as it almost exclusively inhabits the large intestine, it is very rarely vomited like the true *Ascaris*,[*] though the constitutional symptoms are the same in both affections. But the presence of threadworms in the bowels excites symptoms of reflex irritation, by which they may be suspected before they are seen. Itching of the nose and anus is the most frequent feature of this kind. At night the irritation becomes so great that sleep may be prevented, and in any case the child is certain to indulge in the dirty habit of continually touching the anus. The finger nails often excoriate the skin around that orifice, leaving marks once erroneously believed to be caused by the biting of the worms. The irritation causes a free discharge of mucus from the lining membrane of the intestine, and the child constantly voids this at stool by straining, and thereby often producing prolapsus ani. The worms appear in the motions in great numbers, and escape of their own accord from the anus; they even enter the vagina in female children, and set up leucorrhœa. Symptoms of vesical irritation also develop themselves, sometimes stimulating calculus, more usually seen in the form of a frequent desire to pass water. Priapism is also not unfrequently observed in male children troubled with threadworms, and Lallemand was of opinion that in this manner the parasites produced the habit of masturbation, with its consequent evils. All general disorders, especially those of the nervous system, are aggravated by the presence of threadworms; this particularly applies to the spastic contractions of muscles which produce some forms of talipes.

Treatment.—As the threadworms are mostly confined to the lower part of the large intestine, they are within the access of enemata. An injection of infusion of quassia, mixed with table-salt or sulphate of iron, is perhaps the most effectual method of treatment ; but as it seldom or ever effects a cure at once it must be frequently repeated.[*] Lime water is another good application.[†] Since the bowels generally act irregularly when threadworms have remained long in the large intestine, the treatment should be commenced in all cases by the administration of an alterative aperient, such as grey powder and rhubarb, or rhubarb and soda. When children are strong enough, one grain of calomel and three of scammony is a good aperient to start with. The mucous discharge produced by the irritation of the parasites appears to afford lodgment for them, and so must itself be cleared away to insure their complete expulsion. They rapidly reappear. Two or three grains of santonin at night, followed by a dose of castor oil in the morning, will effect the discharge of these threadworms. Afterwards steel wine, or the tincture of the perchloride of iron, will be useful. Iron acts not merely as a tonic, but also by its admixture with the secretions, it renders the intestinal mucous membrane unsuitable to serve as a nidus for the reproduction of the worms.[‡]

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[*] Dr Goubert in his recent work, 'Des Vers chez les Enfants,' remarks that "They can never reach the stomach or the small intestine, and consequently can never be thrown up in vomiting, as Brèra and P. Franck have asserted." But Dr Pampa describes a case where a child aged ten was troubled by *Oxyuri* appearing in her mouth in the evening, 'Lond. Med. Record,' 1878, p. 524.

Dr R. Liveing informs me that a local application, about an equal quantity of mercurial ointment and lard, smeared on the anal aperture at night, will prove effectual in relieving the itching and preventing the escape of the worms and ova. The child thus gives up the habit of scratching with the fingers, by which the ova are introduced under the nails and then conveyed to the mouth.

Children should not be permitted to drink unfiltered water, nor to eat salad, radishes, or cress, unless thoroughly washed, as the ova of the *Oxyuris* are possibly transmitted in this way. It is significant that of country children, the peasant class are the most subject to intestinal worms. Of course they have more opportunities of drinking out of wells or brooks, and of eating raw food, than have young people in town. So long as infants are fed with breast milk they are not troubled with worms.

The *Ascaris lumbricoides*, or round worm, by no means rare, is however, less frequent than the threadworm. It is best to distinguish the two species by their English names, for, as I have above remarked, the generic name *Ascaris* is still retained by many in speaking of the *Oxyuris*, though the two worms are very different in appearance. The round-worm is a very large parasite, always several inches in length when full grown, and sometimes a foot long. It bears a strong superficial resemblance to the common earth-worm (*Lumbricus terrestris*), which is not a nematode at all, nor even does it belong to the class *Scolecida*. The earth-worm is included in the sub-kingdom Annulosa, and, like the leech, it differs from the Crustacea in lacking true feet. Independently of the different internal structure this worm is much stouter than the *Ascaris*, and bears eight rows of minute bristles, which give its integuments a rough feeling.

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[*] Form. 46:
℞ Sodii Chlorid.
vel Ferri Sulph. ʒj
Inf. Quassiæ Oj.
Fiat Enema.
} A third part to be used every morning.

[†] Form. 47:
℞ Liquor. Calcis ℥vj
Fiat Enema.
} To be used every morning.

[‡] West on '*Diseases of Infancy and Childhood*,' 1859, p. 637.

The male *Ascaris* is rarer and smaller than the female, and its anal extremity is curved as in *Oxyuris*. Davaine has shown that the female produces over 50,000 eggs! That observer, confirming previous researches, has proved that the eggs do not hatch in the intestine of the child in whom the parent worm dwells. The ova are expelled in the fæces, and find their way into sewage-water, &c. They are absolutely indestructible by any natural force, though boiling, or many other artificial processes, will destroy them. They are introduced into the bowels by unfiltered drinking water, &c., and, being dissolved by the action of the digestive juices, the embyros which they contain are set free.*

Not only does the *Ascaris* differ from the *Oxyuris* generically, but it differs also in habitation. It dwells in the small intestine, often in numbers, but never in such masses as are seen in bad cases of accumulations of threadworms in the rectum. It is not unfrequently vomited. A countrywoman in one of the wards of the Samaritan Hospital, in the autumn of 1878, brought up a lumbricus during an attack of sickness after ovariotomy. Mr Alban Doran informs me that a man in St Bartholomew's Hospital, in 1870, vomited several when dying of dysentery contracted a few months before in Buenos Ayres. Still oftener do children throw up round-worms, and in violent retching the parasites may be expelled through the nares as well as by the mouth; or they may remain in the nasal cavities a short time, and suddenly appearing out of the nostrils cause great alarm to the patient and his parents. The *Ascaris* sometimes escapes out of the cavities of abscesses formed after perityphlitis when such collections of pus are opened spontaneously or surgically. They may also enter the peritoneal cavity through typhoid or gastric perforating ulcers. But Davaine has shown that it is quite impossible for the worm to force its own way through the coats of the intestine, as it is not provided with cutting or boring appendages.

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* Davaine, 'Traité des Entozoaries et des Maladies Vermineuses de l'Homme et des Animaux Domestiques.' Goubert's work, already quoted, contains a very clear yet short description of *Ascaris* and *Oxyuris*. The works of Cobbold and Küchenmeister should be consulted by those desiring minute details with regard to entozoa.

Symptoms.—This worm gives more trouble than the *Oxyuris*, and often produces much reflex irritation. The bowels act in an irregular manner, dull pain is felt around the umbilicus or in the epigastrium, and there is itching at the nose and anus. Any malady from which the patient is already suffering will be aggravated. But since, as in the case of the threadworm, the appearance of the worm itself is the only reliable symptom, it is most unjustifiable to subject a child to a long course of worm medicines on suspicion alone. If the worm really exist in the intestine it will soon be discharged in the motions after a few days of treatment. It must be remembered that in cases of round-worm some morbid condition of the intestinal mucous membrane very often pre-exists.

Treatment.—Prophylaxis is more important and more efficacious in the management of disorders caused by this parasite than in cases of invasion of the *Oxyuris*, for the round-worm always appears to be introduced, as an egg, in water, whether taken pure or with raw food washed for the table. As for cure, the physician, knowing that these parasites often do little harm, must not forget that Davaine has recorded several fatal cases where a round-worm has found its way through the glottis during a fit of vomiting. Moreover, the reflex results of the presence of the parasites induce dirty habits, such as picking of the nose or scratching the anus.

By far the best remedy for the round-worm is santonin. From one to six grains should be given to a child, according to age; it may be administered in a powder mixed with sugar,* or as the compound scammony powder.† Dr Eustace Smith speaks highly of santonin in the form of confection.[*] It is advisable to follow up its administration by a dose of castor oil, and then to give tonics, particularly steel wine, or the mineral acids with some bitter infusion. I am in the habit of giving the santonin every other night for about four nights, and during the day a tonic of iron, arsenic, or quinine. I sometimes combine these three remedies together, but I am generally content with the two first (Form. 93). The persistence of the parasite after long treatment will most likely be due to the neglect of prophylactic measures, such as a careful examination into the water supply and the sanitary arrangements.

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* Form. 48:
℞ Santonin gr. iv—vj
Sacchari gr. ij.
Fiat pulvis.
To be taken every third night.

† Form. 49:
℞ Santonin gr. ij
Pulv. Scammonii co. gr. v.
Fiat pulvis.
To be taken at bed time.

Another nematode, *Trichocephalus dispar*, infests the cæcum and colon. It measures over an inch in length, and the anterior part of its body is filiform, the posterior being much stouter. It is remarkable for producing, as a rule, no symptoms of irritation, and it is only recognised in lifetime by the appearance of its ova in great quantity in the fæces. It may be expelled by doses of santonin, or active aperients.[†]

Tapeworm.—The tæniæ are Scolecida, arranged in a distinct order very different from the nematodes. Their anatomy is very complicated, and their method of propagation has already been described in the chapter on "Hydatid Diseases."[‡]

"The tænia[§] is rare in childhood; in 206 of Wawruch's cases, 22 were children under fifteen years of age, the youngest was 3½; Legendre ('Archives Générale de Médecine,' vol. iv, p. 642) has collected from different authorities 26 cases of tapeworm in children under twelve. (In children from fourteen to fifteen months of age, 2 cases; two years old, 1 case; three years old, 2 cases; four years old, 2 cases; five years old, 3 cases; six years old, 3 cases; seven years old, 4 cases; eight and nine years old, 1 case; ten years old, 2 cases; eleven years old, 4 cases; twelve years old, 1 case.) Hufeland, quoted by M. Davaine, has seen an infant six months old, and at the breast, subject to tapeworm, 'on different occasions he passed up to twenty metres (over sixty-five feet) of tænia, *sans accident retentissant sur sa sante.*'"

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[*] Form. 50:

℞ Santonin gr. xv
Pulv. Zingib. gr. v
Pulv. Jalapæ ʒss
Sulphuris loti ʒiss
Conf. Sennæ ℥j.
} M. ʒj three times a day.

[†] The practitioner wishing to identify a parasite which he believes to be *Trichocephalus dispar*, will find specimens (Nos. 86 and 87) in the collection of Entozoa at the Museum of the Royal College of Surgeons, arranged by Dr Cobbold.

[‡] The Museum of the College of Surgeons contains numerous specimens of the beef tapeworm (*T. mediocanellata*). One of these is from a little girl (Entozoa series, No. 116). This is much more common than the pork tapeworm (*T. solium*). Dr Cobbold estimates the proportion in England at 94 per cent. in favour of the former species.

[§] Goubert, op. cit.

The treatment will be similar in childhood to that adopted for adults. The remarkable words which we have left in their original language at the close of the above quotation fortunately apply, at least to a great extent, to most cases. The extract of male-fern is as efficacious in the young as in the old. It is a good plan to see that the bowels are effectually emptied before beginning the specific treatment, and to attain this end, a mild aperient should be given occasionally, and the diet, for a few days, ought to consist only of milk and beef tea. When the attempt is made to dislodge the parasite a dose of castor oil should be given at night, and the oil of male-fern early on the following morning.* Foreign writers prefer pomegranate and kousso for children. Goubert gives 15 grammes (equivalent to 231 grains) of pomegranate-root bark, in decoction, to children under five, and 20·40 grammes for a child from six to twelve, in 750 grammes of water, to be taken in three doses at intervals of half an hour, followed by castor oil if the parasite be not passed within six hours.

The exotic and rarer parasites hardly come within the scope of this work. But, in conclusion, a few general remarks may be made on the symptoms which worms are capable of producing, and how difficult it is sometimes to form a diagnosis.

Symptoms of an obscure and deceptive character, which cannot be classified under any definite disorder, and which vary from day to day, are frequently cleared up by the discovery of worms. Lurking mischief in the lung or brain has been apprehended in some cases, or the approach of fever has seemed imminent in others. Fits of passion, violent screaming, restless sleep, and even fits of epilepsy or chorea, have been ascertained to depend upon these parasites in the intestines, and the symptoms have been found to pass away on their expulsion. A child so affected loses its animation, and is languid and out of sorts; it suffers from headache, and its temperature is high in the evening. This has been known to reach 103°, or more. The child becomes weak and thin, and ceases to thrive; the appetite is capricious, and it sometimes refuses almost any kind of food that is offered, while at others it is quite ravenous; the eyes are dark and hollow, the tongue is furred, and there is sometimes a dry hacking cough which makes parents anxious, although they are assured that no lesion in the lungs can be discovered. Such cases are often ascribed to commencing tubercular mischief in the lungs or brain, and the best observers have been misled in their diagnosis. The cough being the result of intestinal irritation the child recovers its usual health as soon as the worms are removed.

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* Form. 51:
℞ Ext. Filicis Liquid. ʒss—ʒj
Syr. Zingib. ʒj
Pulv. Acaciæ gr. x
Aquæ Cinnamomi ad ℥j.
M. Fiat haustus.
} For a child from five to ten years old.

These symptoms are very treacherous, and they continue so obstinate in some cases that only time can clear up their true meaning. They may simulate brain disease by the occurrence of a convulsion followed by squinting. Vogel mentions the case of a child who was attacked by convulsions, and a few days after with all the symptoms of acute hydrocephalus, followed by death in a few hours. On a post-mortem examination, the brain and all the internal organs were found in a perfectly healthy state, but there were more than a hundred round-worms, in the intestinal canal rolled up in small and large balls, at some points completely choking up the calibre of the canal.*

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* 'Diseases of Children,' 1871, p. 207.

CHAPTER XXVII

DISEASE OF THE NASAL CAVITIES

CORYZA—NASAL CATARRH (COMMON COLD, OR COLD IN THE HEAD)—*Nature—Causes—Pathology—Symptoms—Treatment.*—OZÆNA—*Nature—Causes—3 Forms.* 1. SCROFULOUS OZÆNA.—2. SYPHILITIC OZÆNA.—3. TRAUMATIC OZÆNA—*Symptoms—Treatment.*—EPISTAXIS—*Nature—Causes—Treatment*—LARYNGEAL AND TRACHEAL IRRITATION IN YOUNG CHILDREN—*Symptoms and causes—Diagnosis from croup—Local and general treatment.*

THE entire mucous membrane in infancy and childhood is prone to morbid action, commencing at the mouth or nostrils, and frequently exciting catarrh, not only in the larynx and air passages, but in the intestinal tract also.

The mucous membrane of the nose is liable to hyperæmia, inflammation, and tumefaction.

Coryza, or cold in the head, is a common ailment, and is frequently observed in delicate and strumous children. It is most common in winter, but it may occur at all seasons of the year. It may be associated with bronchitis, laryngeal catarrh, measles, whooping-cough, &c.

Causes.—These are exposure to cold when the surface becomes chilled. There is, according to Rosenthal, a heat-producing area, and a heat-radiating area, and when a loss of balance takes place between the two, a chill to the surface brings about this frequent ailment. If heat-loss and heat-production are equivalent, no harm results from exposure. Whenever a person is exposed to cold, the cutaneous vessels undergo contraction, so that the blood accumulates in the internal organs, and more animal heat is evolved, than is usual. Hence a child more easily catches cold, if it is not sufficiently protected by proper clothing, or the temperature of the rooms in which it lives and sleeps is too low. When, on the other hand, the atmosphere of the room is too hot, or active exertion is undertaken in it, so as to induce free perspiration, the vessels of the skin dilate, and animal heat is freely given off. The vaso-motor nerves of the vessels of the air-tubes become partially paralysed, and hence a catarrhal state is easily set up. If now, as often happens, the child exposes itself to a draught of cold air, or goes into an apartment that is many degrees too low, then the vessels which are dilated lose their power to contract, and the blood, instead of passing freely through them as before, stagnates in them, or accumulates in the deeper tissues or organs of the body. All the morbid elements, instead of finding an outlet through the skin, accumulate in the blood, to the detriment of the patient's general nutrition. If the atmospheric air inhaled at the same time be not pure, another evil is added; the lungs, like the skin, do not part with a sufficient quantity of carbonic acid, and the condition of cold may lead to some more serious state. Every case is not equally severe. When the blood is only slightly contaminated with refuse products, the cutaneous vessels, after moderate dilatation, soon resume their normal calibre, and a cold is either avoided altogether, or it is very transient in duration.

Living and sleeping in close and badly-ventilated rooms, where the temperature exceeds 65°, never fails to exhaust children or adults. Persons living under such conditions are peculiarly subject to catarrh. When the blood is charged with carbonic acid and other deleterious gases, the lungs are all the more susceptible to the impression of cold; the capillaries become relaxed, and congestion having taken place, inflammatory catarrh is readily invited. The atmosphere is, in these cases, not only charged with excess of carbon, but is also loaded with morbid germs, and the debilitated dwellers in overcrowded rooms are peculiarly susceptible to their influence.

Local irritation arising from fog and mist; the entrance of dust into the nostrils, air laden with pollen from hay, and repeated blowing of the nose, are all excitants of nasal catarrh.

The most intense nasal catarrh is sometimes induced by taking a few grains of iodide of potassium. I myself suffered from sleeplessness and severe pain across the frontal sinuses, with great irritation of the lining membrane of the nose, and a peculiar sensation of fulness and tightness across the forehead, in consequence of taking this drug. The discomfort was so peculiar and severe, that I never before experienced anything at all like it from the most severe catarrh.

Pathology.—The capillaries are swollen and engorged with blood, producing hyperæmia and congestion of the mucous membrane. This furnishes an acid, saline, and watery secretion, which inflames and even excoriates the lips. In severe cases the submucous tissues are infiltrated, and the pharyngeal glands are enlarged, or even ulcerated. As the swelling of the mucous membrane diminishes, the discharge becomes thicker in consistence, and even purulent in character.

As to the possible contagion of catarrh, it cannot be denied that the frequency with which colds run through a household, seems to prove that those who suffer may by contact impart it to the healthy. Using the same pocket handkerchief may become another medium of conveyance. The contagious principle given off by sneezing or coughing, may excite irritation in a healthy mucous membrane, and produce catarrh.

Symptoms.—The earliest symptoms are those of dryness and titillation, with the sensation of obstruction in the nostrils, which induces a disposition to blow the nose frequently. This is accompanied with sneezing and pain across the frontal sinuses, or even headache. The voice is thick and nasal, the conjunctivæ are injected or inflamed, and tears run down the cheeks; if the discomfort is so great that there is much blowing of the nose, considerable epistaxis may result. The larynx may be involved, inducing soreness and hoarseness, whilst the catarrh may extend up the Eustachian tube, producing deafness and singing in the ears. There is more or less febrile disturbance, loss of appetite, and thirst.

A large number of cases of incurable deafness, chronic conjunctivitis, and lachrymal disease, have been traced to frequent attacks of coryza.*

Treatment.—When an acute catarrh is developed with febrile disturbance and running of the nose, confinement to bed in a warm room, fluid food and diluents, will be necessary to encourage diaphoresis, and so relieve the internal organs from mischief. A warm linseed poultice covering the entire chest is often comforting and beneficial. Ipecacuanha, small doses of tartarated antimony with liquor ammoniæ acetatis (Form. 7) will be suitable; while a saline aperient (Form. 8) will cool the system, and bring down the fever. A pleasant cooling drink may be made by adding one teaspoonful of acid tartrate of potash (cream of tartar) to a pint of barley water, sweetened and flavoured with lemon juice. It acts as a refrigerant, diuretic, and aperient. A correspondent speaks highly of full doses of the tincture of belladonna night and morning in severe coryza. Two doses generally complete the cure. As children bear this drug so well it may be given in suitable cases.* Fruit lozenges, and lozenges of Iceland moss and chlorate of potash are demulcent, and encourage secretion. Morphia and other sedatives require to be given with great care to children, for by arresting secretion they may increase the congestion of the mucous membrane, and derange the health.

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* 'Brit. Med. Journ.,' vol. i, 1880, p. 490.

Ozæna.—The mucous membrane of the nose is also liable to an eczematous or ulcerating surface, from which a thick, irritating discharge escapes. The mucous membrane is thickened and congested, as in ordinary catarrh. This is followed by the drying up of the secretion into thick crusts, which almost close the nasal cavities, and become a source of great annoyance to the child. When these crusts are removed the surface is found ulcerated beneath.

The discharge is muco-purulent and bloody, escaping from one or both nostrils, highly offensive in odour, tedious in duration, and difficult of cure. When the patient lies down the discharge may trickle into the larynx, and set up congestion and irritation there.

The leading feature of ozæna is intense fœtor of the breath. The discharge may be too offensive for the patient to go into society, and yet the nasal bones remain unaffected. When the discharge is of this character we may suspect that diseased bone is at the root of the evil. There is sometimes burning and throbbing pain in the nostrils, and the integumental covering of the nose is red and swollen when the discharge does not freely escape.

Causes.—These discharges are met with in delicate children, and not unfrequently follow tedious catarrh, or the eruptive fevers, as measles and scarlet fever. Ozæna may be associated with syphilis and scrofula. A blow on the nose may act as an exciting cause.

Mr Warrington Haward, in an excellent paper on ozæna, from which I have gathered much information for this article, classifies the disease under three principal heads. 1. Scrofulous Ozæna. 2. Syphilitic Ozæna. 3. Traumatic Ozæna. He also mentions an "Idiopathic Ozæna" not referable to either of the above causes.†

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* 'Brit. Med. Journ.,' vol. i, 1877, p. 220.

† 'St George's Hospital Reports,' 1874—1876, p. 130.

1. *Scrofulous ozæna.*—A large number of cases of ozæna appear to arise from scrofula in children. The skin and mucous membranes are especially liable to be affected in this diathesis, and hence we see troublesome eczema, strumous ophthalmia, otorrhœa, bronchial affections, and chronic diarrhœa. Children with this constitutional taint suffer from enlarged cervical glands, which sometimes ulcerate and are slow to heal. The nasal mucous membrane is thickened and swollen, and pustules and small round ulcers are seen on the lining membrane. This form of scrofula is often accompanied by troublesome eczema (Haward). The horrible fœtor of ozæna is owing to the discharge being either pent up in a cavity from which it cannot escape, and therefore it decomposes, or to the presence of a piece of dead bone. In the latter case, no antiseptic injection will be of any service till the necrosed bone has been removed.

2. *Syphilitic ozæna.*—Syphilis is the next most common cause of ozæna, of which there are symptoms not to be mistaken. The ulcers are superficial, or deep, excavated, and sloughing; they are larger, fewer in number, and more irregular in outline than in the preceding variety. When the bone becomes affected, the discharge is most offensive.

3. *Traumatic ozæna* is the result of injury to the nose, or of the presence of some foreign body. This sets up periostitis, followed by necrosis of the bone, and the cure depends upon its removal. In children, peas, beans, bits of wood, or pencil are sometimes thrust up the nose, giving rise to inflammation and ulceration of the mucous membrane. If the offending body is removed before the bone is diseased, the discharge, which depends on a local cause, usually soon ceases.

"*Idiopathic ozæna,*" according to Mr Haward, seems to frequently follow scarlatina and measles. In my own experience a very severe case of ozæna followed measles in a child who had no constitutional taint. A thin, semi-purulent, and sometimes gleety discharge continued for many weeks, but ultimately ceased. The nasal mucous membrane was red and swollen, and easily bled on examination or blowing the nose.

When purulent matter is pent up in the sinuses, there is severe frontal headache, and sleeplessness at night. Cases are mentioned where the discharge has found its way into the cranium, or the sinus has become so distended that it has encroached on the orbit, and displaced the eyeball.

Treatment.—With the aid of the laryngoscope the nasal cavities, previously washed out by means of the nasal douche, can be well examined. Mr Haward also recommends that the nostrils be dilated by Fraenkel's speculum, which he says is the best.

In the treatment of *scrofulous ozæna*, the general health must be attended to. Cod-liver oil, steel wine, the ammonio-citrate of iron, or reduced iron will be necessary. The nasal cavities may be washed out frequently with a solution of common salt (half an ounce to a pint of slightly warm water), or tincture of myrrh ʒij, chlorate of potash ʒij to a pint of water, or ʒij of Condy's fluid to a pint of water. Sea air is of the greatest utility.

In the treatment of *syphilitic ozæna*, mercury must be employed, and the best mode of using it, according to Mr Haward, is the calomel vapour bath, recommended by Mr Henry Lee. Hyd. c. creta for children is valuable, whilst iron, bark, cod-liver oil, and iodide of potassium are to be given at the same time. As a local application, when the bone is not affected, Mr Haward recommends an ointment of fifteen or twenty grains of red oxide of mercury, and olive oil and lard, of each half an ounce. After syringing with the nasal douche, this should be applied with a brush. He also speaks well of the ammonio-chloride of mercury ointment, with olive oil.

In the *treatment* of the *traumatic form*, antiseptic washings will be needed, and the necrosed bone must be removed if present.

For the management of the *idiopathic* forms, the general health will require attention, and the application from time to time of a lotion of chlorate of potash and myrrh. Glycerine of tannic acid, and dilute mercurial ointment, are also useful in some cases.

Carbolic acid has been found very serviceable in ozæna, and in other discharges from the nose and throat. All mucus should be first cleared from the affected parts by a weak alkaline solution, and then carbolic acid (1 in 40) should be injected along the floor of the nostrils, or into the pharynx, as the case may be.*

A diluted tincture of iodine (1 in 30) may be sometimes injected into the nostrils with advantage.

In chronic ozæna, where the mucous membrane is in a relaxed and weak condition, twenty to thirty grains of alum added to eight ounces of water form an excellent application. It should be injected up the nostrils with a bottle syringe, or one end of an elastic tube may be inserted in a basin containing the solution, at a proper height, and the other placed in the nostril. If the head is bent forward and the mouth kept open, the fluid will permeate the nasal cavity and run out of the other nostril. Carbolic acid is preferable where there is much fœtor.

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* 'Brit. Med. Journ.,' 1869, vol. i, p. 145.

Mr Pugin Thornton recommends a cold lotion[*] to be injected daily up the nostrils by means of a hand-ball spray apparatus. He says it has succeeded in very obstinate cases, after the inhalation of camphor, benzoin, and carbolic acid had failed. Eight or ten applications have cured the most obstinate cases.[†]

Glycerine of tannin is another application, particularly useful in syphilitic ozæna. Iodide of potassium may be cautiously given, but small doses of mercury with bark or iron in such a case would be preferable, as this salt so often induces nasal irritation.

Nitrate of silver (gr. v. ad ℥j) is serviceable where the mucous membrane is swollen, and the complaint seems within reach.

In those cases that resist all medical treatment, a surgical operation may become necessary.

Epistaxis is the most common form of spontaneous hæmorrhage, arising in all likelihood from the slender resistance which the walls of the vessels afford to the force of the blood current. The rupture too, in many instances, probably depends upon a morbid state of the capillary walls or the hæmorrhagic diathesis.

Among the causes which predispose to this affection, are catarrh and whooping-cough, tuberculosis, disease of the spleen, and the exanthemata. A blow or fall on the nose may excite bleeding at once. One of the worst cases I ever saw was that of a girl suffering from typhoid fever, where the blood had become thin and deteriorated. Plugging of the posterior nares was required to arrest the profuse bleeding; the patient bled from the bowels and urinary tract at the same time, and the body was covered with hæmorrhagic spots (petechiæ).

Epistaxis is rarely seen in very young children or in those who are strong and well developed. It is most common in the delicate, who have weak muscles and thin bones. The blood may flow from one or both nostrils, either in drops or a full stream. If the hæmorrhage should happen during sleep, the blood flows back into the pharynx, and excites cough if it gets into the larynx, or vomiting if it goes into the stomach. If, as often happens, coagulation takes place quickly, the hæmorrhage is speedily checked; but if the blood be thin, the tendency to coagulation is so slight that the patient may bleed till the lips and face are pallid, the conjunctivæ blanched, and the skin is of waxy whiteness. After continued and great loss of blood, the heart becomes weak and irritable, there is faintness and prostration, the surface is damp and sweating, there is restlessness, headache, and even delirium.

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[*] Form. 51A:
℞ Sodæ Carb.
— Biborat. āā ʒij
Liq. Sodæ Chlorinatæ ʒss—ʒij
Glycerini ℥j
Aquam ad ℥viij. M.

[†] "The Treatment of Ozæna," 'Brit. Med. Journ.,' 1880, vol. i, p. 475.

Treatment.—Absolute rest in bed, in a semi-erect posture, should be observed in all cases of nasal hæmorrhage where the loss is considerable, and the effects of the drain are telling upon the system. It is most important to avoid blowing of the nose, which, however, in children is by no means easy to prevent. Holding the nostrils tightly between the fingers, and applying cold to the bridge of the nose will stop the hæmorrhage in most cases. If this fail, the injection of iced water up the nostrils with an ordinary bottle syringe may prove effectual. The introduction of powdered alum, or ox-galls has sometimes succeeded. Internally, gallic acid, sulphuric acid, tincture of the perchloride of iron, and ergot will be suitable remedies. Sir T. Watson mentions the simple expedient of the patient raising one or both arms above his head, and of maintaining them in this position for some time.* In cases which resist all ordinary treatment, we must have recourse to the unpleasant operation of plugging the posterior nares.

Laryngeal and Tracheal Irritation in Young Children.—No sooner is the respiratory apparatus called into play than it becomes liable to disease, and it remains so from infancy to old age, especially in this variable climate. We have recorded, on the authority of Orfila, Cruveilhier, and others, that traces of inflammation and its products are even sometimes met with in the bronchial tubes and structure of the lung during fœtal life. "The great transition," says Dr Churchill, "from the atmosphere of uterine life to the severe and changeable atmosphere of extra-uterine existence, renders the infant peculiarly susceptible." Exposure, as in dressing, to draughts of cold air, readily excites the mucous membrane of the air passages, which becomes vascular, tender, and irritable. At certain seasons of the year, when the thermometer is lower than usual, affections of the breathing organs are very common among young children.

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* 'Principles and Practice of Medicine,' 4th edit., vol. i, p. 795.

Bronchitis, croup, pneumonia, arising from cold, or as a sequence of scarlatina and measles, come constantly before us; but there is a condition, not expressed by either of these terms, which is apt to be overlooked, from the absence of marked physical and general signs, and from the insidious manner in which it commences and steals on. This condition is at first one of purely local irritation, occupying the larynx and trachea, neither extending to the pharynx and tonsils nor into the bronchial tubes.

A very common mode of its commencement is the following:—The nurse observes that the child (probably from one to two years old) is quite well, with the exception of a slight cold, but there is no cough or other disturbance of the system; all the functions are regular, and the child sleeps well; it perhaps looks pallid, and the nostrils and upper lip are red, caused by frequent wiping of the nose, as in older children and adults when suffering from catarrh. This state of things goes on for several days, and if the weather should become mild, the child goes out of doors as in health, and the cold—for it seems no more—passes away. Should circumstances, however, prove unfavorable, these symptoms are soon succeeded by a short, shrill, barking cough, unattended by the prolonged inspiratory effort of croup and laryngismus; the pulse is quiet, and there is no fever. If the medical attendant is consulted at this stage he observes nothing of importance, the muscles of the larynx and neck are tranquil, and the child when asleep leans his head forward on his chest. The nurse will tell you that the cough is the only troublesome symptom; that it wakes the child, and makes him peevish and fretful—no doubt from the extreme tenderness and irritability of the membrane involved. The chest is clear on percussion, and there are no moist sounds from base to apex. The affection is often ascribed to teething, and on looking into the mouth, the gums may be inflamed from the pressure of new teeth. Another day elapses, and perhaps in the night the child starts up in his sleep, flushed and excited, with one or both cheeks red; the skin is hot, and the little patient is irritable and alarmed: the cough is louder, more barking, and resembles croup; the respiration is not quickened in proportion to the pulse, the alæ nasi are not active, nor is the countenance anxious and distressed, as would be the case in pneumonia or croup. On looking into the throat no redness or change of any sort can be observed. As the disease creeps on, the child becomes prostrate, loses appetite, and will not leave the nurse's arms or lie down in bed. If you apply the ear or stethoscope between the scapulæ at the upper part, you may hear a little crackling at each inspiration, or slight rhonchus; but the percussion sound is clear throughout the chest, and the respiration is normal in all other parts. If these symptoms are not relieved, genuine bronchitis, pneumonia, or convulsions may supervene—conditions favoured by the state of the atmosphere and the constitution of the patient.

So far as I have seen, the face never, at any period of the complaint, assumes that bluish tinge from imperfect aëration of the blood unless these complications arise. The physiological causes of this condition must be ascribed to nervous excitation; and, in very young children, we see how this may be set up. The trifacial nerve, the pneumogastric nerve, and the spinal nerves, are all separately irritated and disturbed in their functions during the period of dentition, and in gastric and intestinal disorder. Under the combined influence of cold, teething, and gastric disturbance, how easy of explanation are these laryngeal symptoms. Now croup is the disease most likely to be confused with this affection, and when we are first consulted we may reasonably pause before committing ourselves to an opinion; but there are the following broad distinctions:—If the child can talk, there is neither hoarseness nor huskiness of voice; the fever is never high; the respiration not perceptibly hurried; the cough may be sudden, convulsive, and ringing, but the crowing inspiration is absent, and there is not the restlessness and anxiety of croup, nor is the larynx either tender or apparently the seat of uneasiness. The cough and expiratory bark are the symptoms of all others that resemble croup; and, at an early stage, it is difficult to decide on the disease that may be about to spring up; but when twenty-four or thirty hours have elapsed, we shall have very little difficulty. When this condition has lasted a few days, the child being one day better and another worse, you may almost with certainty give a favorable prognosis of the termination. As a rule, the precursory stage of croup does not last beyond a day or two; the hoarse voice and catarrhal symptoms being rapidly succeeded by more marked and decided proofs of a dangerous disease.

As to the treatment of these cases, first and foremost is a warm, moist, and equable temperature, not lower than 60° Fahr., or above 70°. In the acute stage of genuine croup, it might be necessary to raise the temperature of the apartment higher than this. The cases under consideration are less acute and threatening; and it is therefore necessary that surrounding influences should not be too exhausting. If there is a choice of an apartment it should be large and airy, and candles should be used in preference to gas and lamps. On many occasions I have noticed two large gas burners in small and low nurseries at the top of the house, where one or two children with their nurse are living through the day; so that the allowance of oxygen for each person must be very limited, and calculated to impair the general health, and to keep up rather than subdue the tracheal irritation. On removing such patients to larger and better ventilated apartments they have speedily improved; but it is necessary to maintain a moist atmosphere, and for this purpose it is an excellent plan to place a flat kettle on the fire, with a long tube projecting above the guard of the fireplace into the room. At the end of the tube should be a transverse top, perforated with holes, like a garden flower-pot, to allow the steam to escape gradually. Such kettles are sold under the name of " Bronchitis Kettles." In all cases of croup and laryngeal irritation they will be found of great value. Where they are not obtainable, an ordinary kettle of water should be kept boiling on the fire; and even a hot brick or fire-ball should be thrown into a pan of hot water. This keeps up warmth and moisture in the room, and soon exerts a soothing effect on the irritable membrane. When the symptoms are urgent and the cough is distressing, a sponge wrung out of hot water and kept constantly applied to the throat will give relief. In less severe cases I usually employ a piece of rag soaked in tepid water, and apply it round the throat under oil-silk. This is both a convenient and good remedy. Mustard and vinegar poultices to the throat, strong liniments and other applications of a stimulating character distress and irritate the child, and are not to be thought of. If, as will generally be found, the stomach and bowels are not satisfactorily performing their functions, we should lose no time in applying suitable treatment. The motions are often scanty and light coloured, sometimes containing undigested articles of food; sometimes of a greenish hue and highly offensive. A grain of calomel, if the child is from one to two years old, with two grains of jalapine and two of white sugar, will be necessary, and this will usually stir up the liver and small intestines; after a free action of the bowels the breathing will improve. In some cases I have seen, the breathing has been good in the morning and the child has appeared lively, and even played with his toys; but towards the afternoon and evening, cough has come on, and he has been more than once sick in the attempt to dislodge a little glairy mucus from the larynx. Succeeding in this, the child has gone on again comparatively well, as in whooping-cough, till the returning spasm and vomiting. But in most cases the discomfort is aggravated towards evening, and he passes a restless night, getting no sleep from the irritating cough. Under these circumstances, it is a good plan to give an emetic at bedtime; say a small teaspoonful of ipecacuanha wine in an equal quantity of simple syrup. This will usually cause vomiting, and if not, it may be repeated in ten minutes, or even a larger dose given; but this is sufficient in most cases, and the child is not depressed by it. A saline and diaphoretic mixture, with two or three minims of ipecacuanha wine, and the same quantity of the compound tincture of camphor, will relieve the cough and calm the nervous system.

When the more acute symptoms have subsided, a grain or two of bromide of potassium may be added to each dose of the mixture with advantage. Where the cough is very irksome, a teaspoonful of a mixture composed of equal parts of aromatic syrup of senna, syrup of poppies, and syrup of squills, is worth giving occasionally. I sometimes substitute the syrup of buckthorn for the senna. This generally opens the bowels, and saves the necessity for more active medicine. Debility, pallor of face, and a wasted and wan look, overtake the child when shut up in one room long together; and this is soon accompanied by a thick white fur on the back of the tongue, darkness under the eyes, and tremulous pulse. A grain of the carbonate of ammonia should be given at this stage, with a few drops of syrup of tolu, under the influence of which the tongue cleans and the child resumes his liveliness; to this should be added a few drops of the tincture of cinchona. The child may now be brought downstairs into a large room, and gradually prepared to be taken out of doors. Throughout an illness of this kind it is most important to support the bodily strength with beef tea, veal or chicken broth, milk, thin arrowroot and water, to which a third part of milk is added, or a little isinglass in milk and water.

CHAPTER XXVIII

CROUP—(LARYNGO-TRACHEAL DIPHTHERIA OF SOME WRITERS)

PATHOLOGY—*Nature of the exudation—Two varieties of croup—1. The catarrhal or mucous—Treatment—2. The fibrinous or membranous.—Symptoms, course, and progress of each form—Morbid appearances—Clinical characters of true or typical croup—Diagnosis from diphtheria and laryngismus—Treatment—Warm vapour—Emetics—Antimony—Mercury—Aconite—Tracheotomy.*

AMONG the diseases of young children, croup occupies a foremost position, from the occasional suddenness of its accession, the rapidity of its course, and the danger attending its termination.

True croup consists in an inflammatory condition of the mucous membrane of the larynx and trachea, with the exudation of plastic lymph, which is quickly transformed into a firm adhesive membrane.

The disease is modified by the age and constitution of the child, and spasm or inflammation may be more severe in one case than in another. It is generally acknowledged to be more frequent among male than female children. In my own experience, three fourths of all the cases that have come under my notice have happened to males.

We may fairly speak of two varieties of croup. 1. *The catarrhal or mucous.* 2. *The fibrinous or membranous.*

1. *Catarrhal or mucous croup* (*non-membranous croup—catarrhal laryngitis—false croup—stridulous laryngitis*) most frequently occurs in children of nervous and excitable temperament, from two to seven or eight years of age. I have seen it many times in strong and well-developed children. In some instances we learn that the child has always had a delicate chest; that any exposure to damp weather brings on catarrh and a croupy cough, or the disease may be traceable to bronchitis, or be complicated

with measles and whooping-cough. The symptoms are slow and insidious in some cases and the catarrh which precedes the stage of development excites no alarm till the hoarse voice and ringing cough announce the true character of the affection. In other cases, and they are the most common, the symptoms are more sudden in their accession. Delicate children are sometimes seized whilst at play. In one case that came under my care, a boy, 8 years of age, left his playmates at 4 p.m., complaining of an uncomfortable sensation in his throat, and in less than six hours the cough became loud and barking, and the distress in breathing extreme. In another case, a strong and healthy female child, 2½ years of age, was seized with croupal symptoms at 11 a.m., and eight hours afterwards they had attained alarming severity. Her parents assured me that she had slept well, and was very lively till the attack came on. In these cases laryngitis would seem to begin at once. Still some catarrhal and feverish symptoms are often present for a day or two before the real attack. If an emetic be given at this stage the breathing rapidly improves, though the symptoms may return in a few hours, and require similar treatment. In the majority of cases the following day will see the child in a fair way to recovery.

A croupal sound in breathing is common enough in the laryngeal and tracheal affections of young children. It may have its origin in, 1. Spasm of the glottis owing to irritation of the laryngeal nerves, as in teething and intestinal disorders. 2. In diphtheria from the deposit of false membrane in the larynx, which offers a mechanical obstacle to the admission of air, and also from spasm, which the deposit partly occasions. 3. In both forms of croup—catarrhal and fibrinous.

I have already mentioned the chief symptoms of catarrhal croup, but a few more remain to be noticed. The child may have been ill a day or two before the attack, but it is generally sudden and unexpected. It may come on in the night, after the child has gone to bed apparently well; there is some heat of skin, and the temperature in some cases may reach or even exceed 103°; there is frequent, loud, and husky cough, followed by a long inspiration; the pulse is accelerated, and the face is flushed. The movements of the chest are laboured, and the abdominal muscles retracted. The eyes are staring, and the child is agitated to a degree seldom seen in any other affection.

The tendency to a recurrence of catarrhal croup is a favorable sign as regards its severity and danger. Such cases rarely have a fatal termination. If we are told the child has had one or two previous attacks we may generally prognosticate a satisfactory issue. But in the most severe forms of this affection the attack does not subside quickly, the catarrh extends into the bronchial tubes, and the child gets no interval of relief; in fact the dyspnœa sometimes increases to an alarming extent, and the poor child fights desperately for breath till death takes place from convulsions or asphyxia. Moreover, catarrhal croup may pass into the acute inflammatory or membranous form which we have next to consider.

Treatment.—Success depends on meeting the symptoms with promptitude. The mucous membrane of the larynx and trachea is in a state of inflammatory excitement, and the vessels are full and congested. Suitable measures rapidly unload the distended vessels and encourage expectoration. In many cases after a warm bath and the free action of an emetic (the room being kept moist and the temperature high) the symptoms soon decline, and the child is himself again, with the exception of being a little prostrate and pallid. It may be necessary, as in fibrinous croup, to place the child in a tent bedstead, that he may breathe an atmosphere of steam. This is managed by means of a "croup kettle."

2. *Fibrinous croup* (*membranous croup—pseudo-membranous laryngitis—tracheo-laryngitis*) is the typical variety of the affection in its severest form. This is a more acute or intense inflammation; it is a true tracheitis, leading to the exudation of a plastic material, the inflammation affecting not only the mucous membrane, but the fibrous tissue beneath. I will describe the course of the disease, according to my own personal observation. It generally begins with hoarseness of voice, and a peculiar harsh and ringing cough, because there is absolutely no secretion, for the same reason there is a sense of constriction in the trachea. The respiration is hurried, and the inspiratory effort is long and crowing. A few hours will bring about the most severe symptoms; the pomum adami may be seen rising and falling very conspicuously with respiration, the eyes become swollen and bloodshot, the lips dusky, and the alæ nasi active; the skin is hot and dry, and the pulse small, hard and rapid. The temperature may reach 105° or more. The child may put his hand to his throat, and, in a deep hoarse voice, say that he cannot fetch his breath. At this stage the percussion note is clear over the thorax, the respiratory murmur is much diminished throughout the chest, and loud sonorous râles

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attend it. No moist sounds have as yet been heard. As the case goes on the croupal exudation becomes more organised, and clings to the larynx, or trachea, when, if the case progresses favorably, either the cast is thrown off, or resolution ensues with absorption. If the disease is extending, inspiration is greatly impeded from blocking of the trachea by false membrane; there may be a tough piece of lymph in the trachea which cannot be dislodged. Notwithstanding the laborious and painful respiration, the child may, nevertheless, sleep soundly, though waking occasionally in terror. Thirst is generally present, and swallowing may be painful, but I have known a child drink a large cup of milk half an hour before death. Still, any attempt at deglutition is generally painful, and brings on cough. The pulse now becomes small and weak, and reaches 160; and the crowing and hissing sounds in respiration increase. When the symptoms have attained this intensity, recovery is rare; the voice falls to a whisper, or departs altogether, and the cough is weak and suffocating. Sometimes, even at this stage of threatening strangulation, shreds of lymph and false membrane are expelled by a violent paroxysm of coughing; but the relief is only temporary, and the agony of oppressed breathing soon returns. The countenance now betrays the most painful anxiety; it is bloated and distressed, the tongue and lips are dusky, and the forehead and surface of the body are bathed in sweat. The pulse becomes feeble and thread-like, occasionally intermitting, or falling in frequency. The child is restless, and constantly turning about for relief, throwing the head back against the spine, or from side to side, while the fingers are bent in the palms of the hand. Agony is depicted in every feature. The struggle for breath goes on till the little sufferer dies convulsed, or passes into a state of stupor from which it never wakes again. A case that came under my notice illustrates the sudden fatal termination not infrequent in this disease. The child, æt. 3, had been going on well for two days, and was sitting up in bed, playing with her toys and breathing tranquilly. In the night the respiration became embarrassed, and she died asphyxiated twelve hours from the period of relapse. After death a thin piece of partially detached croupal exudation was found lodged in the glottis, and this caused the fatal symptoms.

The false membrane lining the air-passages varies in extent; in one of my cases I found, on opening the larynx and trachea, three long and narrow pieces of lymph, one upwards of two inches in length, and the other nearly as long, between the lower border of the cricoid cartilage and the last rings of the trachea, without any extension to the bronchi. In this case moist sounds were heard in the chest on the second day of the illness; but they had disappeared on the fourth and fatal day. Near the level of the upper border of the cricoid cartilage were to be seen small tough fragments of lymph, not readily detached from the surface beneath. The mucous membrane was everywhere red, and in places vividly so; but there was not any evidence of submucous effusion, for it must be remembered that the connective tissue of the larynx is very small in quantity. In other cases, lymph may be observed throughout the trachea, and the mucous membrane may be pale, except in isolated patches where it is red and vascular. The false membrane varies much in form and consistency, sometimes it is cylindrical in shape, and loose, or adherent to the mucous membrane beneath from which it is not readily separated; in other instances it is moulded to the shape of the bronchial tubes, where the inflammation has extended into the lungs, and in these cases the efforts of vomiting fail to bring away the source of irritation, and the danger to life is thereby increased. When the false membrane is loose and fragile, it is easier of expectoration; and these cases have the best chance of recovery, particularly if limited to the larynx and trachea, the lungs not being involved in the inflammatory process.

Of late so much difference of opinion has arisen on the pathology of croup that we are induced to ask what is understood by the term?* Until recently it has generally been regarded as a local disease, an inflammation of the trachea attended with the formation of false membrane (croupal exudation), though the practical physician most commonly recognises the disease by the spasmodic closure of the glottis, the prolonged and crowing inspiration, and the fear of impending suffocation. If to these symptoms are added fever and inflammatory excitement, he has no doubt whatever that he is dealing with a case of genuine typical croup, such as had been known before diphtheria was recognised and distinguished in this country. To me it appears that croup, whether simple or membranous, is a totally different disease from diphtheria, and that they only approach any degree of relationship when the latter disease has invaded the larynx, and then the symptoms due to obstructed breathing are much the same in both cases.

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* The result of the discussion on membranous croup and diphtheria at the Royal Medical and Chirurgical Society in 1879 was, that membranous laryngitis may arise from common inflammation, or in connection with specific disorders of various kinds, but that the most frequent cause is diphtheria.

We constantly meet with genuine croup of an acute and local inflammatory character, leading to the well-known false membrane in the trachea and larynx, as described by the old authorities. It seems impossible that we can mistake this true croup (which we have been in the habit of meeting with all our lives) for the peculiar affection of the trachea and the constitutional symptoms common to diphtheria. It is well to glance at some remarkable points of difference in the two affections.

1. True croup is prone to attack the healthiest children, and in districts where diphtheria does not prevail.*

2. True croup is apt to come on very suddenly, and in cases of recovery the general health is rapidly re-established, as compared with diphtheria.

3. In diphtheritic croup the disease is of a well-marked constitutional character, and is always accompanied by great depression and nervous symptoms.

4. Croup is a local disease; diphtheria is a constitutional affection, in which the kidneys and intestines may be involved. Croup is neither infectious nor contagious; diphtheria is both.

5. The cases that recover from diphtheritic croup are few, and the convalescence is not only very slow and tedious, but the throat affection is usually preceded by a characteristic membrane on the palate, and the prostration is always great. Partial loss of voice,

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* There are many instances on record of a whole family of children dying of diphtheria in the course of twenty or thirty days. Malignant epidemics of this nature have prevailed in this country since 1857; but we have never known of three cases of genuine croup happening at one and the same time to a single family, and we have never known them last so long. The recurrence of diphtheria in the same house has been noticed over and over again, and traced to bad drainage, proving that the power of contagion lurks and lingers about, ready to seize on any person lowered in health or susceptible to its influence. The disease is most prone to attack delicate children, whose homes are badly ventilated, and where sanitary precautions are neglected.

It would be impossible for the want of space to enter here into the long and vexed question as to whether the croup of Home and Cheyne in this country is the same disease as the "diphtherite" of Bretonneau. I can discover nothing to warrant this conclusion, for, if identical, surely modern writers would have had their attention directed to the resemblance in the course of long and varied experience. Diphtheria is a disease only recently described with precision; as soon as attention was directed to it physicians at once recognised a new disorder, both in its anatomical and clinical features, entirely different from anything they had previously seen, and presenting symptoms at complete variance with the so-called inflammatory or true croup.

fœtid breath, swollen neck and glands, diminution of muscular power, paralysis of the muscles of deglutition, and albuminuria are common in diphtheria; but they are not witnessed in inflammatory croup.

6. Between croup and diphtheria there is also another very important diagnostic difference; diphtheria generally begins in the pharynx, croup in the larynx.[*] Croup may extend downwards into the trachea, but never upwards into the pharynx. The false membrane found in the larynx in cases of genuine croup is quite different from the leathery or yellowish-grey exudation found on the tonsils, in the larynx, and bronchial tubes in cases of diphtheria. The pathological differences between croup and diphtheria are open to further contrast. In the early stage of croup there is an increase in the vascularity of the affected membrane, as in severe catarrh, with a trifling amount of inflammatory exudation. This is succeeded by fibrillation of the exuded lymph, which, with the new-formed cellular elements, becomes transformed into the characteristic *false membrane*. Its consistence varies, being in some cases tough, in others soft and amorphous, and easily removed from the mucous membrane beneath. In the larynx and upper part of the trachea, where the inflammation is most acute, the exudation is croupal or membranous, and is very characteristic of true croup, but in the lowest part of the trachea and diverging bronchi, there may be nothing more than a scanty superficial layer of mucus.

The histological changes that occur in diphtheria and croup are difficult to distinguish one from another. In diphtheria, however, the sub-mucous tissue is, as a rule, far more extensively involved, and the false membrane is less readily removed; portions of tissue lose their vitality and slough from impediment to the circulation, and on removal there is loss of substance.[†]

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[*] "My idea of the problem to be solved is, in fact, this:—It must be admitted that the diphtheritic poison is capable of giving rise to a plastic inflammation of the larynx, apart from the existence of any similar affection of the pharynx. But there is good reason to believe that during epidemics of diphtheria the cases in which this occurs are in the highest degree exceptional. If, therefore, it can be shown that in the practice of a general hospital the cases of plastic laryngitis, of uncertain origin, bear a large proportion to the total number of cases of diphtheria, there will be a strong probability that the majority of the former cases are dependent upon some other cause than the diphtheritic poison."—*Diphtheria and Croup*, by W. H. Lamb, M.B., and C. Hilton Fagge, M.D., 'Guy's Hospital Reports,' 1877, p. 345.

[†] 'Pathology and Morbid Anatomy,' by T. H. Green, M.D., 3rd edition, 1875, p. 303.

The following affords an excellent illustration of the comparison between croup and diphtheria.

Dr Sansom has related a case of pharyngo-laryngeal diphtheria with albuminuria, in a female child four and a half years old, where tracheotomy was resorted to on account of dyspnœa and embarrassed breathing. White patches were observed on the pharynx and right tonsil. The edges of the wound were covered with diphtheritic false membrane, and sloughing proceeded, accompanied with extreme prostration. A wound of the ring finger of the right hand was covered by false membrane, and from this wound ulceration extended, and involved a part of the right hand. During the following week there was little change, then extreme adynamia ensued, pneumonia attacked the bases of both lungs, and the child died sixteen days after the operation of tracheotomy. After death the larynx was covered with false membrane, the tissues around the tracheal wound were infiltrated, and there was sloughing of the soft structures. The kidneys were in a state of acute nephritis, and the lungs showed diffused broncho-pneumonia.*

The treatment that would put an end to catarrhal croup would aggravate a case of diphtheria and hasten death. A child suffering from croup is put to bed in an atmosphere of steam, and after the action of tartar emetic and perhaps a grain of calomel, the alarming symptoms gradually subside. This is never seen in a case of diphtheria—the nervous prostration which invariably accompanies it would be increased and life probably sacrificed by the adoption of such treatment.

Laryngismus stridulus is another disease which has been mistaken for catarrhal croup; but the following diagnostic points of difference are so broad and clear that in ordinary and well-developed cases it would be inexcusable to confuse them:

1. Laryngismus usually sets in suddenly with alarming symptoms, and terminates abruptly; in true croup the invasion is less sudden, there has generally been cough and febrile disturbance for a day or two, and the symptoms, instead of declining, go on increasing in severity.

2. In a typical case of laryngismus the voice is unaffected, and there is no cough; in croup there is both cough and change of voice, and the latter is often weak and feeble from the commencement.

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* "Croup and Diphtheria: a Contrast," 'Med. Soc. Proc.,' vol. iii, 1875-77, p. 105.

3. In laryngismus there is no expectoration nor any catarrhal sounds in the chest; in croup such symptoms are constantly met with.

4. In laryngismus there is no fever (that is, sufficient rise of temperature to deserve the name of fever), and the circulation is undisturbed, except during the paroxysms; in croup the fever runs very high, there is thirst, heat of skin, and quick pulse.

5. Age comes greatly to our aid. Laryngismus is most common in infants during dentition; croup is most frequent between the second and fifth year.

6. Laryngismus is most common among strumous and rickety children, and those who have been ailing and out of health. It is constantly associated with dentition, and over-feeding or improper food; croup often attacks the healthiest and strongest children, and generally arises from exposure to cold winds, or damp—it is far more frequently fatal than laryngismus, which is only exceptionally dangerous.

7. In croup there is not the same immediate violent struggling for breath as in laryngismus; then, too, in laryngismus there is complete recovery between the paroxysms.

8. In laryngismus the condition is one rather of syncope or fainting; the attacks are usually too short to produce permanent lividity from imperfect aëration of the blood.

9. In laryngismus death may occur from complete asphyxia; in croup a sudden termination may result from a portion of detached false membrane exciting fatal spasm of the larynx; but death usually happens from interrupted respiration and circulation through the lungs, with gradual depression of the vital powers.

10. In a case of laryngismus the inspiratory effort is temporarily affected, arrested, or even stopped entirely; whilst in croup, the embarrassed breathing is permanent, and expiration as well as inspiration, are both involved.

11. The treatment of the two affections is diametrically opposed; the remedies that would relieve the one would aggravate the other.

So much for the distinctions of laryngismus from croup, which I have thought best not to pass over. But I must not dismiss this question of diagnosis without admitting that there are complicated or mixed cases, attended with wheezing and catarrhal symptoms, where inflammation is mixed up with the spasmodic affection. The spasmodic element enters largely into these cases. The laryngeal nerves are excited at the commencement of the disease, and the distress in breathing is alarming to witness. They may be termed cases of catarrhal croup, combined with considerable laryngeal spasm. There is some swelling and inflammatory action of the larynx and vocal cords added to the original spasmodic affection. The mucous membrane of the larynx is highly irritable and sensitive, and readily becomes inflamed and swollen on exposure to cold air. The cough, wheezing, and dyspnœa might induce even a practised observer to think he was dealing with an ordinary case of croup, but as it advances he is able to satisfy himself that genuine spasm is chiefly at the root of the evil. In the simplest forms of catarrh in some young children, the voice is hoarse and the cough barking. A diagnosis therefore is not invariably easy at the beginning of the illness.

Treatment of fibrinous croup.—The temperature of the sick room should not be lower than 65° or above 70°, and the air of the apartment pure and sweet. The child should be put to bed and kept at perfect rest. He should not be encouraged to talk. He ought to be placed in a tent-bedstead, so that he may breathe an atmosphere of steam generated from a "croup kettle." If the tracheal membrane is dry relief is sure to follow as soon as it is moist, and the amount of secretion must be the guide to continuing the steam. If the air of the sick apartment is kept too long moist, the child is apt to become exhausted. The earlier the case comes under treatment the greater is the probability of success, because it is then possible to prevent the tracheal secretion from becoming organised. One of the greatest difficulties we have to contend with in the management of croup is a relapse, because with it comes exhaustion, and the weaker the patient the less is the chance of recovery. Tartarated antimony in acute and sthenic cases is an excellent emetic, not so much from any specific effect it exerts on the tracheal membrane, as from its certainty in exciting free vomiting. In less sthenic cases, sulphate of zinc acts well and quickly. Ipecacuanha wine and antimonial wine, in equal proportions, are sometimes preferable. Alum is selected by some practitioners, as it readily induces vomiting without causing exhaustion. A teaspoonful of the powder may be given for a dose in water. Whatever emetic is chosen it will require to be repeated every three or four hours during the acute stage, till the respiration improves. When the emetic has fully operated, if there be much febrile excitement and disordered primæ viæ, which aggravate the laryngeal symptoms, a grain of calomel should be given every four hours, or one full dose for the purpose of emptying the bowels and controlling the fever will be found necessary. If after vomiting the temperature remains high, and especially when the bowels have acted freely, minim doses of tincture of aconite every three or four hours, will be of great service in acute inflammatory croup. This keeps up gentle diaphoresis, diminishes tension of the pulse, and controls vascular excitement in a very striking manner. At this stage alkalies are serviceable, and of these three or four grains of chlorate of potash may be demanded to favour the expulsion of the false membrane; in some cases a few drops of the tincture of perchloride of iron may be added to each dose.

In the *fibrinous* form, when there is acute and violent inflammation, with a firm, hard pulse, and a full reserve of strength, two or three leeches may be applied over the thyroid cartilage. Bleeding can be easily arrested by pressure with the finger, and if need be, with cotton wool. Mercury may then prove a valuable addition to the antimonial treatment. Some of my cases improved from the moment the mercury affected the bowels, the fever diminishing and the expectoration of the false membrane being promoted. When employed in small doses at regular intervals, it would appear to diminish the cohesive attachment of the lymph to the mucous membrane, and to render it less fibrinous. If the case is seen at an early stage, and is satisfactorily progressing at the end of forty-eight hours, we may generally augur a favorable termination, and we should then begin, if not before, to support our patients with good beef tea, milk, and arrowroot, and (it may be) a little wine and water.

The application of ice to the throat is sometimes of service in reducing the inflammation, and is not incompatible with the inhalation of the steam of hot water at the same time. It may be applied in the following manner: take a piece of india-rubber silk tissue, about eight inches square, gum its edges with a small brush dipped in chloroform so as to form a bag. Then fill it with smooth lumps of ice, varying in size from a small to a large nut, or even larger, according to the size of the patient, and close the end of the bag with chloroform. Wrap the bag in a piece of lint, and lay it on the throat. If the child be restless a turn or two of calico bandage round the neck will keep the bag steady. The iced bag must be changed frequently, especially if a steam kettle be also in use. Ice to the throat has proved serviceable in acute croup, diphtheria, and other inflammatory diseases of the larynx and trachea.

On the question of *tracheotomy*, I am inclined to think we may urge a great deal in its favour.* The indications for its employment are interference with the oxygenation of the blood, as shown by lividity of the lips and recession of the trachea, supra-clavicular region, and epigastrium, denoting obstruction to the entrance of air into the lungs.

In most of the cases of tracheotomy that have fallen under my notice, I have almost invariably observed an improvement for a time in the respiration, and the fact that a few days have been gained when death must have terminated in as many hours is a great point in favour of the operation, and for not delaying it too long. If tracheotomy is to succeed, it must be done before the strength is exhausted and asphyxia has set in.

If tracheotomy be delayed till the lining membrane of the larynx and trachea are covered with false membrane, extending as far as the primary divisions of the bronchi, and the constitutional symptoms are becoming severe, the chances of its success are materially diminished.

When extensive, or loose, or purulent portions of false membrane occupy the primary branches of the bronchi, and extend to and choke up the smaller or minute bronchi, the operation cannot be expected to succeed. It is frequently performed as a last resource, when the respiration is impeded and embarrassed, and exhaustion has advanced too far. Under a combination of asphyxia and asthenia the child sinks.

In those children who survive the operation for some days, bronchitis, pneumonia, broncho-pneumonia, and convulsions are the most frequent causes of death. A tendency to pulmonary excitement already exists, and indeed the operation itself is calculated to originate it. Tracheotomy is a very successful operation when performed for the relief of chronic laryngeal diseases, or for the removal of foreign bodies from the air-passages. But it is significant that this operation does not generally yield satisfactory results when undertaken in cases of œdema of the glottis occurring in children who have sucked boiling water from the spouts of kettles. After this grave accident, lung affections very often supervene, from the inspiration of scalding vapour simultaneously with the boiling fluid. Tracheotomy aggravates the pulmonary complication; yet it must be done, on account of the œdema of the glottis. Very similar considerations apply to croup. In some cases where children have been saved from the prospect of immediate death by tracheotomy, and the canula cannot be removed with safety for a moment without the danger of asphyxia, the chances of ultimate recovery are very slight. The little patient, having rallied from the operation, goes on satisfactorily for some days, when it becomes restless and feverish at night, with a hot skin and a quick pulse. If we auscultate the chest, we find extensive bronchitis, and perhaps some pneumonia. No more sputa are evacuated through the canula, and the child soon becomes convulsed, or dies in a comatose condition. There may be no accumulation of false membrane in the larynx, but if the glottis is nearly closed by swelling and œdema, and the mucous membrane injected and vascular, the extension of inflammation down the trachea and bronchi into the tissue of the lung, is almost certain to ensue. If the case goes on, abscess of a portion of the lung, pleurisy, or empyema are among the morbid changes discovered after death. From all I have been able to ascertain, the operation of tracheotomy is less likely to succeed in children under two years of age, than in those above it. The trachea is small and undeveloped, it is not so easily reached as in older children, and hæmorrhage may occur, but a competent surgeon may overcome it. Yet in the face of these difficulties, infants have survived the operation; but the greatest number of recoveries has occurred between the ages of five and six years.

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* See the remarks on tracheotomy in the next chapter.

It has been alleged that the direct admission of air to the lungs without having previously passed through the mouth and nasal passages is attended with real danger, and that congestion of the lungs is another danger induced by the operation. But seeing that the temperature of the room can be raised to any extent, and that appliances for the supply of warm moist air are to be procured, congestion of the lungs from this cause alone ought not to occur.

CHAPTER XXIX

DIPHTHERIA

SYMPTOMS.—*Period of Incubation—Insidious approach of the disease before any complaint of illness is made—Elevation of temperature—Weakness of the pulse, an early and significant feature of the disease—Vomiting a serious symptom—Albumen in the urine—Character of the throat affection and peculiarities of the exudation—Constitutional depression and implication of the larynx and voice—Tendency to delirium and restlessness—Death by suffocation or asthenia.—Laryngeal diphtheria*—CAUSES—*Influence of a specific cause—Debility and exhaustion predispose to the affection—Effects of locality and moisture in favouring its occurrence.*—SEQUELÆ—*Anæmia, debility, and paresis—Weak action of the heart, secondary endocarditis—Paralysis of the muscles of deglutition and upper and lower extremities—Impaired vision and deafness—Bronchitis and pneumonia—Albuminuria—Hæmorrhage from nose and bronchi.*—MORBID ANATOMY—*Bronchitis and pneumonia—Fibrinous coagula in the heart—Congestion of kidneys, brain, and spinal cord.*—DIAGNOSIS *of the affection from croup, scarlet fever, and tonsillitis—Secondary diphtheria—Theory of contagion.*—TREATMENT—*Local and constitutional—Necessity of supporting the general strength by nourishment and stimulants—Value of iron and other tonic preparations—Applications to the throat as in scarlet fever—Importance of tracheotomy in imminent death from suffocation—Statistics of Professor George Buchanan, of Glasgow, in croup and diphtheria—Strychnia and galvanism in diphtherial paralysis.*

DIPHTHERIA (diphtherite of Bretonneau) is a contagious and epidemic disorder, characterised by a specific inflammation of the pharynx and air-passages, attended with the exudation of fibrin or other lymph, and the enlargement of the cervical glands. Other mucous membranes, or the skin may be sometimes involved. The vital powers are greatly prostrated. Death takes place from exhaustion, or suffocation through diphtheritic deposit in the trachea and larynx. Diphtheria bears an affinity to the exanthemata, in the fact that it chiefly attacks the young. Dr West some years ago noticed its occurrence after measles, and Dr Dickinson mentions two cases accompanying scarlet fever. The mortality is greatest between the age of five and ten years, but infants of a few days old have been attacked.

Evidence of the antiquity of the disease is to be found in the writings of Hippocrates, Celsus, Aretæus, Galen, and Cœlius Aurelianus. In more modern times, descriptions of it are given by Spanish, Italian, French, and English writers, and traces of its progress have been met with in America, Africa, and Hindostan. It prevailed in Holland in the sixteenth century. By some writers it is thought to be the same disease that was known a hundred years ago under the name of epidemic croup and malignant sore throat.[*] It made its appearance at Tours, in France, in 1818.

This disease, until the last few years, has been confounded with erysipelas and scarlet fever during their epidemic prevalence. The credit belongs to Bretonneau of being the first writer to define its exact nature, and to show that the local appearances on the throat and fauces are the manifestations of a general and constitutional disorder.

Since the beginning of this century, cases of diphtheria have been recorded from time to time by English physicians. In the years 1858 and 1859, the epidemic attained its maximum in this country, and in two years about 20,000 persons fell victims to it.[†]

Symptoms.—The incubation period is variable, though usually very short. The disease has been contracted a few hours after exposure to the virus in some instances, and in others upwards of a week has elapsed. Oertels says it positively occupies from two to five days. From his experiments he proved that in from twelve to twenty-four hours after artificial inoculation on the surface of wounds, a greyish white discolouration, and a dirty greyish layer are to be detected among other signs of infection.[‡] Dr Morell

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[*] Dr Fothergill's account of the sore throat attended with ulcers, 1748.

[†] "On Diphtheria," by Dr. Squire, 'Reynolds' System of Medicine,' vol. i, p. 11.

[‡] Article "Diphtheria," 'Ziemssen's Cyclopædia of Medicine,' vol. i, p. 594.

Mackenzie has given an instance of a prolonged period of incubation, fifteen days elapsing from the exposure to contagion to the appearance of diphtheria.[*] The disease creeps on very insidiously, and may have advanced considerably before any complaint is made about the throat. The earliest symptoms are chilliness, weakness, and lassitude, with pain in the back and limbs, followed by febrile disturbance of varying duration. In some severe cases the fever is transient and soon passes off, but in mild cases it is of longer duration. Elevation of temperature generally marks the commencement of the disease; it may soon reach 103° or 104°, when delirium is often present, or convulsions. And now the temperature may rise considerably higher, reaching 106°, and in one fatal case I saw in a little girl of five, it was nearly 107°; but in many cases the temperature appears to fall as the disease advances, the skin becoming cold, and the pulse slow. These symptoms often precede death. There is headache, thirst, and pallor of the face; the sleep is restless and uneasy, the mental faculties are clouded or excited; the pulse is almost always quick at the beginning of the complaint, and soon becomes weak and compressible. Cases are recorded of unusual slowness of the pulse, and Dr Heslop mentions one in a child of five years of age, where it did not exceed forty beats a minute.[†] The tongue is covered with a thin, creamy fur, or it is quite clean except at the posterior part. The appetite is small, and the prostration of strength so great that patients are too weak to exert themselves to take food, and consequently many die, who reasonably might be expected to recover if they could take a proper amount of nourishment.

Vomiting is often a troublesome symptom, and is of serious significance. "Out of 120 consecutive cases of diphtheria treated at Great Ormond Street, not one single child that vomited recovered.[‡]"

The urine is pale; it contains urates or even phosphates, and at an early stage albumen is frequently found. Albuminuria is one of the most interesting features of the disease. Attention was first drawn to this symptom by Dr Wade, of Birmingham.[§] It generally appears at an early period of the disease. It is a frequent complication of diphtheria and increases the danger to life. The urine may be so albuminous as to become quite solid when heated.[*] Whether albumen is present in large or in small quantity, it is a serious symptom. But albumen bears no relation to the other symptoms; it is equally present in mild as in severe cases. Casts of the urinary tubes do not invariably accompany the most profuse albuminuria,[†] and the albumen may disappear altogether in the course of a few days, as the approach of convalescence is reached. Greenhow remarks that he has "several times been unable to detect albumen by the proper tests in very malignant cases of diphtheria."[‡] It is said to be less frequently present in laryngeal diphtheria, than in the faucial form, where it is in much larger quantity.

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[*] 'On Diphtheria,' 1879, p. 19.

[†] Greenhow on 'Diphtheria,' p. 211.

[‡] 'Medical Times and Gazette,' Sept. 23rd, 1882, p. 377.

[§] 'Midland Quarterly Journal of the Medical Sciences,' 1858.

On looking into the throat, some redness or swelling may be observed on the fauces, pharynx, and tonsils; there is pain in deglutition, and stiffness of the neck in separating the jaws. The cervical glands are often enlarged in the faucial form, and very rarely where the larynx only is affected. The eyes have a heavy, languid look, and the conjunctival vessels are injected; the nostrils are inflamed, or obstructed from swelling of the Schneiderian membrane, or the presence of a tenacious secretion. Between the first and second day from the commencement of the throat symptoms, the tonsils become more swollen, and a fibrinous exudation can be seen coating them, as well as on the back of the pharynx, which is now turgid and assumes a claret hue. Over a part of the inflamed surface, a tough layer of grey-looking lymph is deposited, resembling wetted chamois leather or damp parchment, which continues to increase in thickness; in some instances it is very thin and superficial. This *false membrane* (which is pathognomonic of the disease) is not invariably of the same colour; in some cases it presents a dirty white or yellowish appearance; in others it is of a brownish or ash-coloured hue, and in exceptional cases it has a blackish, gangrenous look, and is horribly offensive.[§] In some cases the exudation is first seen on the soft palate, or on one or both tonsils, but wherever it may be, it either extends from one part to another, or it simultaneously appears on several parts at the same time. Spots of exudation, which at first are separate and distinct, will coalesce and form a continuous layer in a few hours. The extent and colour of the exudation are generally in proportion to the severity of the disease. When there is a light and small distinct patch the disease is mild and runs a favorable course; but when the exudation is extensive or thick, or the patches unite or form a continuous layer, then the constitutional depression is great, and the patient is in imminent danger of his life. In some cases cough is a very early symptom.

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[*] 'Clin. Trans.,' vol. xvi, p. 39.

[†] Greenhow on 'Diphtheria,' p. 204.

[‡] Ibid., p. 207.

[§] Inflammation is not essential to the disease, according to some authorities; but this is a question which pathology ought to decide. Diphtheria is distinguished by a peculiar morbid condition of the mucous membrane of the throat and tonsils. A sero-mucous effusion is poured out on the back of the throat, which becomes changed into a tenacious membrane, followed by the formation of another similar membranous formation, till a tough plastic layer is produced. The false membrane can be raised from the surface which is ulcerated and bleeding. The pellicle of false membrane is chiefly made up of thickened epithelium coagulable lymph, pus, and blood-corpuscles.

When the exudation has fully formed, it mingles with the secretion from the mucous follicles, and the cervical and submaxillary glands become enlarged, and the whole neck swells. The child is now much distressed, as there is great pain in swallowing, and the poisonous secretion excoriates the mouth and nostrils. As portions of the deposit separate from the throat and are coughed up, there is great fœtor of the breath, and sometimes bleeding from the mouth and nose. This exudation is tough and fibrinous, and does not separate easily, except where it is undergoing decomposition. When it has separated, it leaves a smooth, bleeding surface, on which the exudation rapidly forms again. As the disease goes on, the respiration becomes impeded by the obstruction to the entrance of air through the larynx, producing diphtheritic croup, and the breathing is croupy and stridulous. The voice is muffled or reduced to a whisper, and the eyes are staring and suffused. The vessels of the neck are distended, and at each inspiration the depressions above and below the clavicles are drawn inwards, and the epigastrium is retracted. With these alarming symptoms there are also pains in the head, which the child moves incessantly; the surface of the skin is cold and clammy, and there is extreme agitation and restlessness. The consciousness becomes more and more impaired, and the child dies suffocated and exhausted. Death ensues as in fatal cases of croup from asphyxia.

When the pharyngeal affection is acute and severe there is great pain and difficulty in swallowing food, but as the disease advances the sensibility becomes blunted, and there is no complaint of pain. The patient sinks low in the bed on his back, and is insensible to all that goes on around him, or he is delirious and muttering; the impulse of the heart against the walls of the chest becomes weaker, and the pulse feeble and imperceptible. In such cases death ensues from asthenia or syncope.

The *laryngeal* form of diphtheria is limited to the larynx and trachea, though such cases are exceptional. It is more common in some epidemics than it is in others, but the disease shows no disposition to primarily attack these parts. Bretonneau puts the proportion at 1 in 30, Guersant at 1 in 20. Of 183 cases mentioned by Dr Yeats, there were 15 in which laryngeal symptoms were present from the first and the fauces escaped.* In an epidemic reported by Dr Thorne there were only 8 cases out of 180 which assumed this form.† From statistics furnished by Dr Dickinson, Dr Fagge and Dr Gee it appears that there is a large number of cases in which the membranous exudation occurs in the larynx and trachea, compared with those where the exudation existed in the fauces only, and there is also a large proportion of cases in which both the larynx and the fauces were implicated, larger than has been noticed in any known epidemic of diphtheria.‡ When laryngeal symptoms occur, the patient may die in the course of two days, but when they are absent death may not happen for two or three weeks. In cases that recover convalescence begins about the second week. "Of the seventy-four cases collected by the 'British Medical Journal,' twenty-six died—fourteen from asthenia, eight from implication of the larynx, three from syncope, and one from subsequent bronchitis."§

Causes.—A specific poison, either generated within the body or external to it, which spreads by contagion and infection. Sir W. Jenner traces "diphtheria (like erysipelas) to cold, when the exposed person is depressed from fatigue, mental or moral causes, &c."‖ It spares no class of the community, affecting the poor as well as the rich, when an epidemic prevails; but it is probable that, notwithstanding the evidence that has been brought forward to the contrary, defective drainage, debility, and exhaustion favour its development. The disease is not peculiar to any particular locality; it has been as prevalent in high and exposed situations as in low and sheltered places; on clay and damp soil, and on dry and light soil; on richly cultivated soil, and on barren moorland ; in the open country and in the densest towns.* It does not, however, appear to be so frequent in dry districts, where the drainage is good and the soil permeable, as in damp, marshy districts in the vicinity of water. Still, this does not clear up the cause of the epidemic, for dry places have been severely visited, and damp places have escaped.

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* 'Edin. Med. Journ.,' 1876.

† 'Report to Medical Officer of Local Government Board,' April 11, 1877

‡ Report of the Committee "On Membranous Croup and Diphtheria," Roy. Med. and Chir. Soc., 1879, p. 8.

§ "On Diphtheria," by Dr Squire, op. cit., p. 139.

‖ Introductory Address before the Clinical Society, 1875.

As to the outbreak in North London, in 1878, Mr W. H. Power found that, with regard to time, the customers of milk retailers who bought their milk of the same proprietor, bore almost the whole of the brunt of the outburst, which first attracted attention to the district, and which was referred to sewer causation. It seems probable that Mr Power's observations must be regarded, in the present state of our knowledge, as rather suggestive and incitive than conclusive.

What the exact nature or essence of the disease is we do not at present know. How the germs of the disease are first developed, whether they ever arise *de novo* (which is not improbable), or whether the soil into which they have been introduced is peculiarly adapted for their growth, are questions which the science of medicine has still to deal with, but certain it is that when a person is struck down with the disease, he is capable of contaminating the surrounding air and drinking water, and so of communicating the disorder to others.

Bretonneau held the view that the atmosphere could not transmit the contagion of diphtheria. He taught that the only way in which it can be contracted is by inoculation—that the diphtheritic secretion must come in contact with "a soft or softened mucous membrane, or with the skin on a point denuded of epidermis."† This is a subject still open to discussion, but most authorities agree that the disease is contagious, and can be conveyed by the atmosphere, invisible emanations from the sick, or even from sewer gas.

Family susceptibility is sometimes very great. All the members of one family may be attacked, whilst those of another family living under the same roof may escape. Some may have the disease slightly, and others severely ; the delicate succumb more readily than the strong.

A correspondent throws out the hypothesis that as the disease often spreads in a family, and does not extend to other persons going freely about the patients, "the poison germ of diphtheria is modified by its habitat, becomes, in fact, a new variety growing out of, and especially adapted to, the constitution in which it has developed, and that this contagion finds in the kindred constitutions of brothers and sisters fit soil for its growth, while it is thrown off by stranger organisms to which it is unadapted."[*] Dr Alfred Carpenter also supposes "that diphtheria is dependent upon a germ of living matter, which is capable of reproducing itself when it meets with a congenial soil." He considers that there is a close analogy between it and potato blight, the conditions which promote the one have also an influence upon the other. He adds that sulphurous acid, locally and generally applied, is the best application, and that the germs cannot grow in a creasote atmosphere.[†]

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* Greenhow on 'Diphtheria,' p. 124.

† New Syd. Soc. Transl.

The clothes of a person may be infected with the poison, and he may thus transmit the disease to others, though he is not labouring under it himself.

An instance came under my notice in November, 1878, where a little boy in health called at a house in which a child was lying ill of the disease; he returned home, was struck down with the disease within forty-eight hours, and died on the seventh day. He conveyed it to two brothers and a sister. The little girl, eight years of age, walked eight miles one day, was prostrate with the disease on the next day, and expected to die on the third or fourth day, but eventually recovered.

Sequelæ.—The heart is prone to become enfeebled, notwithstanding the free exhibition of stimulants and the progress towards recovery. Sudden failure of the pulse and circulation now and then comes on, and the weakness continues till death. Valvular disease of the heart has been known to result from diphtheria. The processes involved in this disease may bring about morbid changes of the endocardium affecting the valves. Dr Burdon Sanderson[‡] has shown the identity of the valvular lesions after diphtheria with the ulcerative endocarditis of Kirkes, well known to result from several acute specific diseases. Sanderson continues by demonstrating what he happily terms the "doubly infective character" of those forms of endocarditis after acute diseases. They result from specific infection, and in turn produce morbid changes in the organs. Infective material becomes detached from the diseased valves, and distributed to the kidneys, liver, and lungs.[*] Heiberg and Weigert go further, and pretend to have discovered the very *fons et origo mali* in colonies of micrococci, which they believe produce the endocardial disease.

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[*] "On the Contagiousness of Diphtheria," 'The Lancet,' Jan. 4, 1879, p. 34.

[†] "A possible Predisposing Cause of Diphtheria," 'Brit. Med. Journ.,' Jan. 4, 1879, 8.

[‡] "Lectures on the Infective Processes of Diseases," Lect. IV, 'Brit. Med. Journ., Feb. 9, 1878, p. 179.

Sometimes the muscular system is fearfully depressed, and the patient loses all power over his limbs, so that he cannot support himself or put on his clothes.

Diphtheritic paralysis may ensue in the course of two or three weeks, oftentimes later. It occurs only in a small proportion of cases of well-marked faucial diphtheria, and it is doubtful whether it ever happens where the exudation is limited to the air-passages. I shall presently allude to three cases in the same family where the paralysis followed membranous deposit in the fauces and tonsils. Authorities differ as to the nature of this paralysis, some regarding it as of reflex origin, and others as due to exhaustion of the cerebro-spinal centres. Dr Wilks says the paralysis deserves to be called *general*, as all the physical powers are affected, and sometimes the mind is enfeebled.[†] Dejerin attributes the paralysis to a degeneration of the motor nerve cells of the spinal cord. He found constant lesions of an inflammatory nature in the anterior cornua with neuritis of the anterior spinal roots. Posterior roots unaffected. Dr Abercrombie found advanced degeneration of the motor cells of the anterior bones of different portions of the cord. Dr Percy Kidd has detected atrophy and alteration in the shape and appearance of the nerve cells of the anterior cornua.[‡]

Symptoms.—Frequently the muscles of deglutition are seriously involved, and the sensibility of the fauces is so affected that there is difficulty in swallowing, and fluids regurgitate through the nose, or pass into the larynx. The voice is weak and nasal, the uvula and velum are relaxed, the power of expectoration is lost or impaired, mucus accumulates in the pharynx, and the taste and smell are more or less blunted. Deafness sometimes ensues. According to the experience of Dr Maund, "the frequency of these paralytic affections is in inverse ratio to the severity of the attack of diphtheria." . . . . Out of two hundred cases attended in East

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[*] See Chap. XL, on "Ulcerative Endocarditis."

[†] 'Diseases of the Nervous System,' 1878, p. 234.

[‡] "Pathology of Diphtheritic Paralysis," 'Med.-Chir. Trans.,' vol. lxvi p. 138.

Kent in 1858 and 1859, not more than ten exhibited any secondary nervous symptoms.[*]

In other cases the sight is impaired, but the weakness of vision resulting from paralysis of the ciliary muscles passes off when the health is restored.

Diphtheritic ophthalmia has been known to occur in connection with malignant diphtheria of the throat and air-passages.[†]

When albuminuria is present it is an unfavorable sign.

Occasionally there is a general loss of sensibility coming on during convalescence.

The paralytic symptoms are generally most severe on that side of the body corresponding to the throat disorder.

Paralysis of the lower limbs, and wasting of the extremities, occur in some cases. The upper extremities are rarely affected. Where the muscles of respiration are attacked danger is imminent. The paralysis is, however, generally curable, and yields to treatment in time.

The three following cases, in children of the same family, came under my notice in July and August, 1880. They illustrate many of the preceding observations.

Case 1.—D. A—, a female child, nearly four years of age, had a severe attack of diphtheria, with copious membranous deposit on the tonsils and pharynx. There was high fever, drowsiness, and albumen in the urine to the extent of one-sixteenth of the quantity passed. The albumen persisted for some weeks. The paralytic symptoms that followed consisted in indistinct articulation and slight squinting. Under tonic treatment the recovery was perfect.

Case 2.—H. A—, a healthy boy, eight years of age, had membranous exudation on both tonsils and back of the pharynx. The constitutional symptoms were more severe than in the previous case, but there was very little albumen. The paralysis consisted in double vision, squinting, articulation almost gone. Could not see black objects, but all other colours. When walking in the street he ran against people in passing. Two months after this illness he was quite well.

Case 3.—A. A—, a boy, aged fourteen, of nervous temperament, was taken ill August 8th. Diphtheritic membrane extended over the arch of the palate, back of pharynx, and left tonsil, thick, tenacious, and wash-leather like. Albumen appeared on the fifth day to the extent of one half. The two following days the urine was nearly solid, then the albumen gradually diminished, and temporarily disappeared on September 9th. It returned from time to time, and disappeared altogether on September 20th. The paralysis consisted in almost complete loss of sight, succeeded by double vision, imperfect articulation, choking, and occasional fainting. An ophthalmoscopic examination showed hypermetrophic refraction, and thinness of the choroid. On the nasal side, and in the substance of the disc, there were seen two distinct nodules of lymph-like deposit, clear and well defined; vascularity normal. The patient made a good recovery.

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[*] 'St. And. Grad. Assoc. Journ.,' 1869, p. 89.

[†] "Diphtheritic Ophthalmia," by Edward Nettleship, 'St. Thos. Hosp. Rep.,' vol. x, p. 27.

Hæmorrhage from the throat, nose, and bronchial mucous membrane occurs occasionally in conjunction with diphtheria; also eruptions of the skin, resembling typhoid fever and measles, are mentioned by different observers. Erythema, urticaria, and dark claret spots like purpura have also been noticed.

Morbid anatomy.—On examining the bodies of children who have died of diphtheria, evidences of bronchitis and pneumonia are frequently seen. In the trachea and bronchial tubes the peculiar membranous formation is found, and on the removal of the exudation the mucous membrane is seen congested and excoriated, and there are small bloody points similar to those observed in the fauces. As the disease descends into the larynx and trachea, the false membrane becomes thin and spreads out like a transparent film, or the exudation is converted into a thick creamy fluid. The false membrane has been observed lining the bronchial tubes to the third or fourth bifurcation. It sometimes extends to the œsophagus and stomach, which are found red and covered with exudation. The mucous membrane may be thickened or ulcerated, and the tonsils may be gangrenous.

The heart has been found small, and its muscular tissue pale; cases, too, of fatty degeneration have been recorded, and the parietes have been studded with black infiltrated patches and petechial spots from sanguineous extravasation. Fibrinous coagula sometimes occur in the cavities of the heart, as in scarlet fever and the pneumonia of children. They may be seen in the right auricle or ventricle, or in all the four chambers of the heart, of firm consistence, and so adherent to the chordæ tendineæ, that the deposit must have happened during life.

The kidneys have been found quite healthy after death, as may be expected when the urine has been free from albumen during life; but careful microscopical examination usually reveals some change of a special character. The kidneys are sometimes only congested in simple cases, but where albumen has been a persistent symptom, some change in the intra-tubular structure will generally be found; the tubules may be blocked with granular matter, oily globules, blood corpuscles, and fibrinous exudation.

The sinuses and membranes of the brain and venous system generally, have been found remarkably full of blood. In a fatal case recorded by Sir William Gull, and quoted by Dr Greenhow, the membranes of the brain and spinal cord were in a state of suppurative inflammation.*

Diagnosis.—The diagnosis of diphtheria from croup is given in the previous chapter.

I may here quote an interesting passage from Niemeyer on the anatomical appearances of the exudation. "If the larynx and trachea participate in the disease, the croupous, not the diphtheritic form of inflammation of the mucous membrane occurs—that is, the surface of the mucous membrane is covered with a more or less tough and consistent false membrane, which may readily be removed, and leaves no loss of substance after its removal. This circumstance has induced some physicians to identify primary genuine croup, which is due to catching cold, &c., with croupous laryngitis caused by infection with diphtheritic contagion. I consider this a false view. The division of diseases, according to the pathologico-anatomical changes they induce, is only a make-shift. In all cases where, as in genuine and diphtheritic croup, we find that two anatomically similar disturbances of nutrition depend on very different causes, we should consider them as distinct."† It is this similarity in the character of the exudation between inflammatory croup and diphtheria which has continually led observers to consider them as one and the same disease; but this certainly cannot decide the question.

The throat in malignant scarlet fever and diphtheria is very much the same in appearance, and may be confounded the one with the other. As regards the diagnosis at the beginning of diphtheria, the more circumscribed redness and the peculiar yellow patch of the exudation is, from an anatomical point of view, so characteristic, that it is conclusive evidence of the disease. Yellowish or greyish-brown sloughs of plastic lymph on the tonsils and pharynx, leaving later on a bleeding surface where the membrane is removed, are common in diphtheria; but in severe instances of either disease, ashy-looking, gangrenous deposits may be seen, and owing to this circumstance, a diagnosis would be impossible. In scarlatina, the constitutional symptoms preceding the throat affection are more marked, the skin is pungent and hot, and the temperature is high; whereas in diphtheria, the throat may be severely affected in the absence of these symptoms, and the pulse and respiration are low. In both diseases the lymphatic glands are usually involved. The throat generally presents a more uniform redness, and the tongue is characteristic in scarlet fever. The soft palate and tonsils have a milky or creamy-like aspect; there is a thick layer, which soon clears off, leaving the parts beneath angry and red. In diphtheria the exudation is more deeply seated, and it comes off in dense membranous layers, representing a cast of the surface on which they have formed.

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* 'On Diphtheria,' p. 239.

† 'Practical Medicine,' vol. ii, p. 615.

The diagnosis from tonsillitis can generally be made; in the latter affection the constitutional symptoms are not of the low and adynamic type which belong to diphtheria, and one tonsil is more affected than the other.

Scarlet fever and diphtheria have prevailed together at the same time and place, and each disease has exhibited the characteristic local symptoms. One member of a family has had the peculiar exudation of the fauces, but no rash or desquamation which occurs in scarlet fever. "Sometimes," says Dr Greenhow,* "cases of diphtheria and scarlet fever have even been intermingled in the same family, or diphtheria has appeared in persons who have been in communication with patients suffering from scarlet fever." Another difference between the two diseases is, that the albuminuria of scarlet fever comes on at a late stage, often at the end of a week or month, after the eruption has left, during the period of desquamation, and it goes on to dropsy and anasarca with hæmaturia. In diphtheria, albuminuria is an earlier symptom when it does occur; hæmaturia is rare, and dropsy does not result, nor is the excretion of urea lessened. The urine does not present the smoky appearance which is common in scarlet fever, but casts of the urinary tubules are generally found.* The presence of albumen in the urine is by no means a constant symptom, even in severe cases, but when it is present in large quantity it is a serious indication. Anasarca is rarely present except in cases complicated with scarlet fever. Uræmia has not been observed in connection with the albuminuria of diphtheria; but excess of phosphates and urates, with high specific gravity of the urine, is of common occurrence.†

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* 'On Diphtheria,' p. 102.

Cases have been described of late which are neither true diphtheria nor true scarlatina, but related to both these diseases in their common origin and pathology. In an outbreak recorded at Caxhill, Westbury-on-Severn, there was no obvious sanitary defect, but the children (between forty and fifty in number) had all been much exposed during a wet and cold season.‡ Further experience of this hybrid affection is necessary before we can speak with authority on its nature.

Secondary diphtheria is occasionally met with as a complication of measles, scarlatina, typhoid fever, whooping-cough, erysipelas, &c.

It has been asked whether there is any relationship between diphtheria and enteric fever, and it appears certain that the two diseases are not unfrequently associated. Dr Murchison considers that it is not true diphtheria, the throat complication in enteric fever being frequently found where there is no diphtheria. As the causes of the two diseases are much alike, we should expect them to prevail together, and not look upon their existence as a mere coincidence. Dr Greenfield brought before the Pathological Society (November 6th, 1877) a specimen of diphtheritic membrane from the larynx and pharynx of a child, aged five, who had been under the care of Dr Murchison at St Thomas's Hospital, suffering from unmistakeable enteric fever. There was ulceration of Peyer's patches, and also swelling and round excavated sloughing ulcers in the lower part of the ileum. In addition there was broncho-pneumonia, but no false membrane could be seen on the fauces or the tonsils, which were red and swollen.

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* Ibid., p. 205.

† Ibid., p. 208.

‡ 'The Lancet,' vol. i, 1884, p. 216.

As to the communicability of the disease, it is held to take place through the secretions of the throat by Bretonneau and others; but the experience of many medical men during the epidemic of 1858 and 1859, does not concur in the opinion that the disease is communicated in this way.* In contemplating the record of cases, however, we can hardly fail to observe that the diphtheritic secretions have induced ophthalmia and throat affections in those persons who have been nursing the sick, or have seized upon the medical attendants who have been close enough to receive particles of the exudation when the patients have coughed or sneezed during an examination of the throat and fauces, or the application of some local agent. The character of the disease so induced, has been in a few instances that have come within my knowledge, so precisely like the diphtheritic exudation, that the evidence of propagation by contact with the secretion, cannot be set aside. The disease has spread with rapidity in the cottages of the poor, where the appliances of the sick are scanty, and cleanliness is disregarded. Then, again, as before mentioned, a child labouring under diphtheria has been brought from a distance to its own home, and soon afterwards the disease has attacked other members of the family, when previous to its return, not a single case had happened in the house, or the surrounding district for many miles.

I think we shall be forced to admit that diphtheria, like typhoid fever, has sometimes a spontaneous origin, when soil and season, temperature, filth and uncleanliness combine to lower the general health, and contaminate the blood. If it were not so, how shall we explain the alarming outbreaks of these diseases in schools and isolated homes, and their tendency to remain within a limited area, and not to spread in an epidemic form?

The infection of the atmosphere by the exhaled air of the sick patient, leaves no room for doubt that this is another mode by which the disease is propagated. Children who have been in the same house with diphtheritic patients have contracted the disease, when they have not ventured near the sufferer; and there are no doubt other vehicles for the transmission of the poison, subtle, tenacious, mysterious, ever ready to seize upon the young, who, being more liable, or more exposed to infection than adults, are more frequent sufferers.

Treatment.—This is a disease demanding local and constitutional measures, and from the first neither should be disregarded. Sometimes the local should be the most energetic, and sometimes the constitutional; but from the commencement the treatment must be supporting if not stimulating, and those measures that are most to be relied on in exhaustion and syncope, are to be held in close reserve. Like other epidemics the disease does not admit of depletory measures, and all practitioners who have had a large experience of it, insist upon the necessity of employing a supporting plan of treatment. Each case will require some modification in accordance with its peculiarities and tendencies, so that it is not easy to lay down any exact rules to follow. The patient should be placed in a large and well-ventilated room, the temperature of which should range from 60° to 65°. He should be kept absolutely quiet in bed with the head low, and all excitement carefully guarded against.

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* Greenhow, on 'Diphtheria,' p. 137.

At the commencement of the disease, a purge of calomel and rhubarb is sometimes required, so that some of the poison may be eliminated by the intestinal canal. Under most circumstances, a mild saline aperient, to keep the bowels regular, will be occasionally required, or a small dose of castor oil; still, caution must be observed in the administration of aperients. Our best guide in this matter is the mildness or severity of the attack, for in the malignant form the child is overpowered by the poison at once, and the pulse is so feeble that any depressing remedy would only hasten the tendency to fatal syncope. Milk in large quantities, beef tea, meat essence, chicken broth, and eggs are the forms of nourishment best suited to maintain the flagging strength. Wine or brandy will be almost invariably needed, and the quantity must be regulated by the strength and frequency of the pulse. Where there is a tendency to syncope or failure of the heart's action, or the pulse is slow, very frequent, or irregular, considerable quantities of alcohol can be taken with advantage. Perseverance in the administration of food and medicine is imperatively demanded, and the attempt must not be abandoned under the impression that the child is unable to swallow, for this is constantly found to be erroneous.

When exhaustion is the leading feature of the case, the child should not be allowed to sleep too long without nourishment. If the throat is painful, and there is thirst, a piece of ice to suck is very grateful and refreshing. A small quantity of iced water should be offered frequently if the mouth and lips get dry quickly. In the shape of medicine, the carbonate of ammonia, with the tincture of bark (Form. 11), is an excellent combination for supporting the system against exhaustion. When the skin is hot, and the temperature high, ice, cooling drinks, and diaphoretics[*] will be useful; with these may be combined the tincture of the perchloride of iron,[†] or the iron may be given alone, or with chlorate of potash. In most of the inflammatory throat affections of children this preparation of iron has a wonderful effect, and is as specific as in erysipelas, which may be possibly due to some antiseptic properties which it exerts locally, and possesses after its entrance into the blood. It requires to be given frequently, and according to some authorities, in large doses. A small dose (♏v to ♏x) with or without the dilute hydrochloric acid, once in four hours, is often enough in mild cases. If the tongue is furred, and the breath fœtid, chlorate of potash in combination with the acid is an excellent remedy, and recovery will take place under its steady continuance. Quinine, salicylic acid, benzoate of soda, when the temperature is high, and the system depressed by the septic nature of the disease, are all useful. When the throat exhibits dark and softened portions of exudation, with a tendency to bleed when touched, or there is hæmorrhage from the mucous surfaces, then the perchloride of iron must be combined with it; and in this formidable complication, a full dose should be given every hour or two, till the urgent symptoms are relieved. In most cases I prefer a mixture consisting of iron, chlorate of potash, and hydrochloric acid.[‡] It is particularly suitable when the exudation is firm, the tongue coated, and the throat exhibits no hæmorrhagic tendency.

Dr Carpenter recommends ammonia as the proper stimulant, so as to reduce the acidity of the blood, and generally in combination with lithia or potash. When the temperature is elevated, the sulpho-carbolate of soda, in his experience, has proved of the greatest possible benefit, the fever subsiding after a few doses, and the patient feeling relieved. The sulpho-carbolate is to be given first with the ammonia, and after a time with quinine. Dr Carpenter deprecates the use of the mineral acids on the ground that they increase the development of the resting spores, and favour relapse.[*]

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[*] Form. 52:
℞ Liq. Amm. Acet. ʒij
Spt. Æthr. Nitr. ʒj
Syr. Rosæ ʒiij
Aquam ad ℥iv.
M. A tablespoonful to be taken every four hours.

[†] Form. 53:
℞ Tinct. Ferri Perchlor. ʒj
Glycerini ℥ss
Aquam ad ℥iv.
M. A tablespoonful every four hours.

[‡] Form. 54:
℞ Tinct. Ferri Perchl. ʒj
Potass. Chlorat. gr. xl
Acid. Hydrochl. dil. ♏xl
Syrupi — ℥ss
Aquam ad ℥iv.
M. A tablespoonful every four hours.

For children five years of age.

The chlorine drink recommended in scarlet fever is equally of service here. It is grateful to the little patients by relieving the throat and febrile symptoms when they are present. It also possesses antiseptic properties, and improves the character of the exudation.

External applications to the throat, in the shape of leeches, blisters, and counter irritants, are in no case requisite, and will do harm. Warm poultices, fomentations, or water dressing, are comfortable and useful.

The applications to the throat internally, are those indicated in scarlet fever, and the same precautions as to strength are to be observed. In young children who cannot gargle, a solution of borax may be applied to the throat (ʒss to the ℥j), or equal parts of the liquor ferri perchloridi and honey may be used with advantage. This is perhaps the best astringent application. In a case under my care a few years ago, a thick solution of chlorate of potash, borax, glycerine, and honey[†] gave much relief to the throat. At an early stage, when the membrane is thin on the fauces and tonsils, a solution of nitrate of silver (gr. x or gr. xx to the ℥j), applied with a camel-hair brush, twice in the twenty-four hours, has been of benefit. If there is fœtor of the breath, and the parts incline to be sloughing and gangrenous, the solution of chlorinated soda, in the proportion of one drachm of the solution to two ounces of water, is an excellent application. This, and the iron solution, are two most valuable measures, in every stage of diphtheritic sore throat. The carbolic acid spray will often be found useful, just as it is in the faucial affections of scarlet fever and measles. Lime water, or lime water with carbolic acid (♏xx ad ℥j), benzoate of soda (ʒss ad ℥j), lactic acid (℈j ad ℥j) sulphurous acid, diluted with one or two parts of water, have also been used in like manner with success.

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[*] "Diphtheria, its Etiology and Treatment," 'Brit. Med. Journ.,' vol. i, 1884, p. 404.

[†] Form. 55:

℞ Potass. Chlorat.
Boracis āā ʒj
Glycerini
Mellis āā ʒss. M.

} The throat to be mopped out with a little of this solution frequently during the day.

Mr Harries, of Aberystwith, has obtained excellent results from "the treatment of diphtheria by the local application of boracic acid in solution."[*] The chances of success seem to depend on combating the local mischief, and preventing its extension from the fauces. His formula for the solution is boracic acid two drachms, glycerine half an ounce, water half an ounce, to be applied every hour to the fauces, and for some days after the deposit has disappeared. Dr Goodhart has more recently sprayed the fauces with equal parts of a saturated solution of boracic acid in glycerine and water. The patient is put into a tent fumigated with creosote and carbolic acid vapour, whilst quinine and iron are given internally. Of six cases so treated, one only died.[†] Sir Joseph Lister has heard of a series of cases without any fatal result from the application of tincture of iodine.[‡]

As regards the operation of tracheotomy when death threatens from suffocation and dyspnœa, Professor George Buchanan, of Glasgow, has recorded some interesting cases of success. Out of thirty cases he had eleven recoveries.[§] He has informed me that in every eight tracheotomies performed on children practically moribund from suffocative membranous effusion into the trachea, he has saved three children, and this is true of over fifty cases operated upon.[‖]

Two interesting cases of successful tracheotomy, in the last stage of diphtheria, were brought before the Clinical Society by Mr George Lawson and Mr Pugin Thornton (Feb. 28, 1879). Two cases of diphtheritic laryngitis have been recorded in which recovery also followed tracheotomy. The first case was that of a boy six years of age, who was admitted into the Middlesex Hospital under the care of Dr Coupland, May 30, 1880. The successful issue was owing to the operation having been performed at an early period of the disease before much false membrane had formed. The second case was also that of a boy, seven years of age, who was admitted into the Children's Hospital under the care of Dr Gee, on Sept. 15, 1879. Recovery followed quickly, notwithstanding the extreme dyspnœa at the time of operation, and the large quantity of membranous casts expelled through the tube afterwards.*

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[*] 'The Lancet,' 1882, p. 307.

[†] 'Clin. Trans.,' vol. xvi, p. 38.

[‡] 'The Lancet,' 1882, vol. ii, p. 851.

[§] 'Brit. Med. Journ.,' 1875, vol. ii, p. 298.

[‖] A statistical table of all the cases, with remarks on the conditions demanding tracheotomy, will be found in the 'British Medical Journal,' vol. i, p. 555, 1880, "Taking the whole of the cases, the result is that nearly *two* out of every *five* operations were successful; and as the operation was never performed unless there was no hope of recovery otherwise, it may be fairly stated that the lives of these nineteen children were *saved* by tracheotomy."

A case of diphtheria in a child is recorded by the late Dr Murchison, in which tracheotomy was performed on account of the urgent dyspnœa. The points of most interest lay in the morbid changes found in the intestines. After the operation, a little thick exudation was removed with relief to the breathing. Death occurred in twenty-five hours afterwards. With the return of the embarrassed breathing the temperature rose to 107·6°, and at the time of death it fell to 104·5°. The interior of the larynx and trachea was completely lined by a layer of false membrane, which was firm in some places, and easily detached in others. At about the fourth ring of the trachea it could be separated in a complete layer, beneath which the surface was red and raw-looking, and "studded with minute vascular points." The larger bronchi, as far as the third or fourth division, were filled with a curdy fluid, and some of the smaller bronchi were dilated. The state of the *small intestines was the chief point of interest in the case,* as the child was said to have been quite well the day previous to admission. The solitary and follicular glands of the small intestines were distinct and prominent throughout, and there were three or four small rounded ulcers apparently connected with them at the middle third of the ileum. In the ileum also, there were three or four ulcers of irregular shape with raised edges, and the Peyer's patches had undergone a change resembling that met with in the earlier stages of typhoid fever. The large intestines were healthy. Both lungs were collapsed and dense; the right cavities of the heart were distended with dark, perfectly coagulated blood. It would appear that although tracheotomy temporarily relieved the distressing dyspnœa, no hope of recovery could have been entertained, where the local mischief was so extensive, and the effect of blood poisoning had become so general.†

But supposing the non-identity of croup and diphtheria is admitted, and that the diseases are in many respects clinically and practically different, still both are prone to terminate fatally by exhaustion, or by suffocation; and these urgent symptoms would seem, at least, to demand the same line of treatment. When the latter condition threatens, and all other remedies have proved useless, we allow that tracheotomy is justifiable, and that the operation has rescued many a little sufferer from an agonising death. Henceforth we must look upon tracheotomy in diphtheria as a proper step to take when the child is beginning to struggle for its breath, and the strength is departing; when the features are livid from obstruction to the circulation, and the mischief is limited to the trachea and larynx. If the larger bronchial tubes are involved there will be no objection to the operation; but if viscid secretion is blocking up the smaller tubes, and there is any sign of pneumonic consolidation, then the operation had better not be attempted.

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* 'The Lancet,' 1880, vol. i, p. 950.

† 'The Lancet,' 1873, vol. ii, p. 771.

For the anæmia and nervous affections which follow diphtheria, citrate of iron and quinine, the mineral acids and calumba (Form. 14—20) should be employed. Strychnia and galvanism are also useful in certain forms of diphtheritic paralysis. Dr Abercrombie states, that belladonna is the only drug, in large and frequently repeated doses, that has any influence over it.* For any albuminuria and prolonged weakness, the tincture of the perchloride of iron and hydrochloric acid are the best remedies. Change to the seaside is essential in protracted cases.

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* International Medical Congress, Lond., 1881, p. 404.

CHAPTER XXX

LARYNGISMUS STRIDULUS

SYNONYMS—*Laryngismus stridulus* (Dr Good)—*Spasm of the glottis*—*Crowing inspiration or spasmodic croup*—*Child crowing* (Marshall Hall)—*Spasmodic or thymic asthma of children*—(German writers)—*Internal convulsions*—*Convulsions interne* (Trousseau, Rilliet, and Barthez).—DEFINITION—SYMPTOMS—CAUSES—*Predisposing and exciting*—*Cases in illustration*—THREE MODES OF DEATH—1. *From asphyxia;* 2. *From congestion of the brain and effusion;* 3. *From exhaustion.*—PATHOLOGY—*A purely neurosal affection of the par vagum or its branches, propagating an irritation to the muscles of the larynx and throwing them into spasm.*—DIAGNOSIS—*From croup and whooping-cough.*—PROGNOSIS—*Favorable in mild cases where the health is good*—*Unfavorable in severe cases.*—TREATMENT—*Removal of exciting causes*—*Mild aperients*—*Belladonna*—*Bromide of potassium*—*Quinine*—*Bark*—*Preparations of iron*—*Cod-liver oil*—*Attention to diet and general health.*

THIS affection is recognised by a peculiar crowing noise during inspiration, and is so characteristic, that, when once heard, it cannot be forgotten. It arises from spasmodic narrowing, or incomplete approximation of the vocal cords.

Symptoms.—As a rule, the general health is below the right standard, and the child is ailing before the seizure happens. It is not uncommon for slight wheezing and catarrh to precede the development of the symptoms for some days, but it is not usually attended with cough. In some cases the child is put to bed in its usual health, and then wakes up suddenly about midnight with difficulty in breathing, the inspiration being attended with a crowing noise like that heard in croup. The attacks often come on in the night, or when the child wakes out of sleep, or attempts to take food or drink. When the child is seized with a severe attack he struggles violently, and fights with his hands clenched, as if about to suffer instant suffocation; the face is livid and congested, the eyes are staring and suffused, the cervical veins are distended, the head is thrown back against the spine, and the whole body is in tremulous agitation. After about a minute or two, and some ineffectual efforts to breathe, the spasm becomes relaxed, and air passes down the larynx with a shrill crowing sound, an indication that all immediate danger has departed. The child now cries and looks terrified, and then in a few minutes generally falls asleep. In exceptional cases, the fæces and urine may be passed involuntarily, but I believe this to be rare.

During the seizure, when the muscular struggling is at its height, the thumbs may be noticed tightly bent into the palms of the hands, and the toes turned inwards and towards the soles of the feet. The wrists and ankles are similarly flexed inwards.

It should be remembered that all cases are not equally severe, nor equally frequent. Some are milder than others, the intervals are longer, and the spasms less pronounced; the child has a mild attack of catching in the breath, with slight and occasional crowing at long intervals, and then perhaps these symptoms pass off altogether if the general health improve; but if not, the spasms may gradually increase in frequency, and several attacks occur during the day. The spasms, which begin slightly in the laryngeal muscles, may become more and more severe, and in some instances terminate in general convulsions and death. Under any circumstances, the seizures leave the child exhausted and drowsy, especially if they are frequent.

When the bowels are disordered, or there are worms in the intestinal canal, some children are liable to a loud, ringing cough, of a purely nervous character. There is excited pulse, and flushed face, but all the symptoms disappear when an active aperient is given, and the source of irritation is removed.

The duration of the disorder is uncertain. In some instances it occurs more or less during dentition, and ceases when the teeth have appeared; in other instances it slowly or suddenly grows worse, and ends in convulsions or asphyxia. If the disorder recur from time to time it is seldom fatal. Spasm of the glottis has been often assigned as a cause of sudden death among infants and young children, which could not be otherwise explained. Dr

Churchill believes that many of the deaths attributed to overlaying the child are cases of sudden death from spasm of the glottis.*

Causes.—These are predisposing and exciting. Among the former are infancy and the strumous diathesis; among the latter teething and worms in the intestinal canal. The disease is frequently associated with general debility, atrophy or convulsions. Enlargement of the bronchial and mediastinal glands has been also enumerated as a cause of the affection, by pressing on the inferior recurrent laryngeal nerve. "Laryngismus has been attributed to enlargement of the thymus, but this view is not now entertained, one very good reason being that post-mortem examinations show that in many instances there is no enlargement of the organ. Moreover, in cases where a large thymus has been found, there has been no laryngismus."† Further than this, the disease is rare in young infants where the thymus gland is largest. "M. Herard examined the thymus gland in six children who died of internal convulsions, and in sixty who died of other affections, and was not able to discover in its condition any causative relation to this disease. Indeed, cases have been reported in which the thymus had undergone more than its usual atrophy at the time when the convulsion occurred (Hasse)."‡ Though enlargement of the lymphatic glands in the thorax is constantly present without causing the disease, I cannot avoid the conclusion that there is some connection between the peculiar shrill squeaking cough when the bronchial glands are enlarged, and laryngismus stridulus. The disease is more frequent in damp and in moist situations than where the air is pure and dry. It is far oftener observed in towns than in healthy country districts. It is also said to be sometimes hereditary, occurring among families of nervous excitable persons. I have myself known three children of the same family who were affected with spasm of the glottis.

All the children of some families suffer from it in a greater or less degree. An instance is recorded where out of thirteen children only one child escaped the disease, although they were all brought up by the same parents.§ Dr West met with 31 out of 37 cases in children between the ages of six months and two years, or at that period when dentition is most active.|| Of 226 cases observed by

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* 'Diseases of Children,' 1848, p. 231.

† 'Reynolds' System of Medicine,' vol. ii, p. 260.

‡ 'Diseases of Children,' by J. Lewis Smith, M.D., 1869, p. 194.

§ Vogel on 'Diseases of Children,' 1874, p. 274.

|| 'Diseases of Infancy and Childhood,' 1859, p. 181.

Dr Steiner, 174 were in the first year of life, and the rest between two and three years. There were 150 boys to 76 girls attacked, and there was frequent evidence of rickets in both parents and children.[*] Males are more subject to the disease than females. Out of fifteen cases under Vogel, eleven were boys. It would therefore seem, as he states, that the larynx at an early period of life is alike distinguishable in form, as well as physiological activity, from that of female children.[†] In the experience of Sir W. Jenner, every child the subject of *laryngismus stridulus* (except two) was the subject of rickets.[‡] The bones of the skull have often been noticed rickety. Out of ninety-six cases of laryngismus there was craniotabes in ninety-two.[§]

Most observers agree that laryngismus stridulus is not uncommon in cases of chronic hydrocephalus, and this has been pointed out by West, Elsässer, Vogel, and many others. Where the nervous system is excited or exhausted it is sometimes seen. I have known attacks to occur so often as to convince me that this is by no means an uncommon cause. Fright, alarm, emotion, anger, loud noises, &c., are all to be enumerated as excitants of the seizure.

The researches of Dr Marshall Hall elaborately explain how the disease may originate through irritation of some of the cranial and spinal nerves.

When the disease is once established, a violent fit of crying, or any attempts at swallowing, or sudden movements will bring it on. Changing the nurse, or giving improper food, will invite an attack in a delicate child, especially if it is the subject of convulsions, between which and laryngismus there seems to be a close connection.[||] The following is a fatal case in point:—On the 27th of January, 1875, I was requested to see the male child of a lady residing in a large and well-arranged house in the west end of London. He was five months old, and was born strong and healthy. A wet-nurse was procured for the first three months, when she left, as her milk was supposed to disagree. The child was fed with milk and Robb's biscuits, and for a few days before my visit, "Chapman's wheat flour" was substituted, which appeared to agree. The child had been successfully vaccinated on the 25th of December from a healthy infant, and from this time the mother thought it had become pallid and flabby. The general condition seemed, however, satisfactory, and the pallor was probably due to his being shut up in the house. There was a large family of children, but none of the others had ever suffered from a similar affection or from any illness of importance. On the day previous to my visit, the child was seized with what the nurse termed croup, being unable to get his breath for some moments, the attack ending in a crowing inspiration and a wheezing cough. The child was irritable and restless, and could not obtain sleep; the bowels were sluggish, and the motions dark and offensive. I prescribed a powder consisting of bicarbonate of soda and rhubarb every night, and a mixture of bromide of potassium and sal volatile three times a day. The child to be fed on cows' milk only.

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[*] 'Diseases of Children,' 1874, p. 129.

[†] Ibid., p. 274.

[‡] Reynolds' 'System of Medicine,' vol. i, 2nd edit., p. 823.

[§] Rühle, 'Kehlkopfkrankheiten,' p. 201, Berlin, 1861.

[||] "Out of 50 cases of laryngismus, of which I have notes, 12 had had eclamptic fits." —*Dr Gee*, 'St Bartholomew's Hospital Reports,' vol. iii.

"The occurrence of general convulsions in connection with laryngismus, indicates that the morbid action extends to and involves some larger group of nerve-cells than in the local spasm, probably either the whole of the medulla oblongata, or the corpora quadrigemina also."—*On Functional Nervous Disorders*, J. C. Handfield Jones, M.B., 1876, p. 631.

Jan. 28th, 9 a.m.—I received a note to say that the child had had four convulsions since my last visit. The nurse had carried him in her arms all the night, and if she attempted to put him down he could not breathe. The seizures were marked by fixed eyes, pallor of cheeks, darkness of the lips, and a convulsive movement of the body. Some of these attacks ended in a long crowing inspiration. When I approached the child at my visit he seemed almost electrified, starting in the nurse's lap, and looking dreadfully alarmed. There was some coryxa, with running of the nose and eyes; the skin was moist and warm; temp. 100°, pulse 156; respirations 36, noiseless. At 3.30 a.m. the bowels had acted well, the motion being of a light yellowish ochrey colour, with slimy discharge. The food was to consist exclusively of two parts of cows' milk and one of sweetened barley water. In the shape of medicine, a mixture consisting of citrate of potash, bromide of potassium, and tincture of henbane.

12 a.m.—Sleeping tranquilly, but on being touched he started convulsively; there had been one attack of crowing since my last visit. At 5 p.m. he was sleeping, and there had been no return of the crowing; at 9 p.m. he was resting in his mother's lap; the face was calm and peaceful; the skin cool; pulse 120.

29th, 9 a.m.—The bowels had acted moderately three times, but the child was continually drawing up his legs and crying, as though in pain; there had been no sickness and no convulsion. He was rather pale; pulse 120, respirations 32; the skin was cool, and the breathing, as ascertained by putting the ear to the back of the lungs, was unembarrassed; the pupils were normal, and he looked round intelligently. I considered he was likely to recover. I went downstairs, and just as I had reached the hall I was summoned again, when the mother handed me the child, whose lips and face were now dark, his limbs relaxed, and he had ceased to breathe. Death must have taken place in a minute from asphyxia.

Cases are commonly met with of a more chronic character, and where there is no immediate danger to life.

Case 2.—On April 12th, 1875, a female child, fifteen months old, came under my care at the Samaritan Hospital, who had suffered more or less from laryngismus ever since she was six months old. The child was rickety, with the strumous diathesis strongly marked, the head was large, and the anterior fontanelle wide and prominent; the veins were distended over the scalp: the face was pale and flabby, and there were only six teeth. Three months before I saw the child she had had convulsions, which continued more or less for some time. The child was often breathless, the respiration habitually accelerated, and the cough croupy. If excited in any way, as playing with other children, the attack was certain to occur, and so bad was it that her mother thought she would sometimes die in it, as her face became dark and purple. Sudden changes of weather, as from heat to cold, or the reverse, were certain to invite a seizure. It sometimes came on in the night. The mother stated that she had suckled the child, having had plenty of milk, but her health was delicate; and till within a short period she had scarcely ever given her any other form of nourishment. The child made a fair recovery, but remained delicate when I saw her a year after first coming under treatment.

Death may take place (1) from asphyxia, as in the first case related where the cavities of the heart are full of blood, and the lungs engorged; (2) from cerebral congestion and serous effusion; (3) from exhaustion and failure of the vital powers. The sudden death probably depends on the transmission of irritation along the cardiac fibres of the vagi to the heart, arresting its action, just as when these nerves are strongly galvanised.*

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* Handfield Jones, M.B., op. cit., p. 633.

Pathology.—An altered state of the nerve centres is said to be present in all cases of laryngismus, and that the immediate cause of the crowing inspiration is due to spasm of the adductors of the vocal cords. The disease would appear to depend primarily on irritation of the pneumogastric nerves which is provoked by disease of the bronchial or cervical glands, or by irritation of the fifth nerve, as from teething, or by disorder of the stomach and intestines. The irritation is propagated to the inferior or recurrent laryngeal nerve, and the muscles of the larynx are thrown into spasm. The larynx is entirely free from inflammation, and there is no lesion of its mucous membrane. It is a purely neurosal affection, and whatever anatomical changes may be found after death are, in most cases, consequences, rather than causes of the seizure. Dr West likens the disease to hysterical fits in the female, and says that both affections are most common when the processes of life are most active.* In some cases, effusion into the ventricles, congestion of the brain, or even tumours in the cerebral substance have been found after death. Tubercle of the lung and bronchial congestion have been also noticed. Still morbid appearances are sometimes entirely absent.

The *diagnosis* from croup is given in the chapter under that heading (page 298), but it may be here stated that in laryngismus the suddenness of the seizure and its departure, the normal breathing in the intervals of the attacks, and the absence of fever and inflammation, are the distinguishing features of this peculiar complaint. As the disease increases there is a disposition to general convulsions, whilst these occur only in the last stage of croup. The crowing sound is not unlike that of whooping-cough, but in laryngismus there is no expectoration, nor vomiting, nor catarrh in the strict sense of the term.

The *prognosis* may be considered generally favorable in slight cases, when the seizures are not frequent, the health is tolerably good, and there is no complication. When the case is mild, and the crowing comes on at long intervals, it usually yields to judicious treatment. Still, the disease is always to be regarded with anxiety, and especially, if severe, from the liability to cerebral complications, convulsions, or sudden death. Out of fifteen cases under Vogel, eight died; Rilliet and Barthez out of nine cases, and Herard, out of seven cases, had each only one recovery.†

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* Op. cit., p. 181.

† Vogel, op. cit., p. 272.

Treatment.—The first indications are to remove all exciting causes. If the bowels are disordered they should be set right as soon as possible by proper aperients, and healthy digestion promoted. If the child has taken a heavy meal, or indigestible food, an emetic may be advisable; and should the gums be swollen, and dentition appear to invite the complaint, they ought to be scarified. The child should occupy an airy apartment, and noise and excitement be precluded. If seen during the paroxysm it should be kept in an upright position, and the windows opened, so that it may be encouraged to breathe. In severe cases, especially if a convulsion threaten, it may be immersed in a warm bath, whilst cold water is sprinkled at the same time over the face. Dr Morley Rooke recorded a case of laryngismus stridulus in a child nine months old, where occlusion of the larynx during the fit produced symptoms like those of "a recently drowned person." The little patient "showed no sign of life" when first seen in the seizure; the lips were blue and swollen, the face a livid grey, and the eyes half-closed and glassy. Dr Rooke thrust his finger between the teeth to the fauces, when the child gave a short heave and a gasp; on repeating the movement inspiration took place, and in a few more seconds breathing ensued. On two more occasions, when occlusion of the larynx was equally severe, a similar manœuvre brought round the child. This is a mode of treatment well worth bearing in mind when the child threatens to die from spasm of the glottis. The cure was completed by bromide of potassium, which was taken for eleven months.* Dr Wardell also points out the beneficial effect of "rotating the finger in the throat" in these cases; it induces an attempt to vomit when the laryngeal muscles become relaxed, and air is admitted into the trachea. He says it is the first thing to be done, and he has seen it succeed when death seemed imminent.†

In extreme cases, where death threatens from asphyxia, the operation of tracheotomy should be employed. The inhalation of chloroform has been recommended in some cases, but then its influence soon passes off, and it cannot be said to have any curative effect. When there is much restlessness, and the child can obtain no sleep, the excitability of the nervous centres must be calmed, and for this purpose small doses of morphia may be cautiously employed. In the intervals of the seizures the bowels must be kept freely open, so as to remove all sources of irritation that might sympathetically excite spasm.

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* 'Brit. Med. Journ.,' 1868, vol. i, p. 370.

† Ibid., p. 474.

Among the chief drugs is belladonna, in the form of extract or tincture, which sometimes has the effect of diminishing the glottic spasm, but in many cases it fails altogether. Bromide of potassium is very serviceable given with citrate of potash, sal volatile, or quinine, according to the peculiarities of each case.[*] Carbonate of ammonia, henbane, bark, and mild preparations of iron, as the ammonio-citrate, or the syrup of the iodide, are remedies to be selected. Dr Harley has recorded a case cured by the valerianate of zinc.[†] If the child is strumous and rickety, or in any way delicate, cod-liver oil is invaluable.

Diet is of great importance, and, when carefully selected, the disease may disappear without drugs. If the child is fed at the breast it is sometimes advisable to change the nurse, or to give cows' or asses' milk. If older, the food must be light and nutritious, and given frequently in small quantities. The clothing should be warm, and if the child is not too ill he ought to be taken out in the open air daily. Sponging the chest with cold water, may be practised with advantage.

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[*] Form. 56:
℞ Potass. Bromid. ℈ij
Tinct. Quinæ ʒij
Glycerini ℥ss
Aquæ ad ℥iij. M.
} A teaspoonful three times a day. For a child one year old.

[†] 'Medical Times and Gazette,' vol. ii, p. 116.

CHAPTER XXXI

PERTUSSIS OR WHOOPING-COUGH

*An infectious disease common in early life—Sometimes happening a second time, and in adult or advanced age—Nature and pathology.—Three stages—1. The catarrhal—2. The spasmodic.—3. The terminal or last stage.—Symptoms of each stage—Influence of peripheral irritation—Ulcers on the frænum linguæ—Complications—Enlargement of the bronchial glands.—Morbid anatomy.—*TREATMENT*—Difficulty in prescribing any plan for general adoption—Occasional utility of local bloodletting in cerebral and pulmonary congestion—Emetics in loaded bronchi—Importance of attention to diet—Counter-irritation—Sulphate of zinc—Zinc and belladonna—Sulphate of atropia—Cannabis indica—Hydrate of chloral—Croton-chloral—Bromide of potassium—Alum—Nitric acid—Hydrocyanic acid—Hydrocyanic acid and quinine—Carbonate of potash—Topical remedies to larynx—Carbolic acid inhalation and spray—Inhalation of bichloride of methylene—Quinine and bromide of potassium in the neurosal stage—Preparations of iron—Change of air.*

WHOOPING-COUGH is an infectious disease of early life, varying in duration from a few weeks to many months. It is characterised by a peculiar paroxysmal cough, and irritation or inflammation in the lining membrane of the air passages. Such a cough or "*kink*" is not met with in any other disease. Sometimes whooping-cough prevails as an epidemic, and sporadic cases are common at all periods of the year; sometimes the attacks are mild, and sometimes they are highly dangerous to life. They are more frequent in cold than in warm weather. It may attack very young infants; but children between the ages of one and seven are most liable to it. After ten years of age it is very rare. The mortality appears to be greater among females (who are more liable to the disease) than males. It may be complicated with pulmonary or cerebral disease, or it may run its course from beginning to end with much spasmodic cough and scarcely any bronchial affection. The disease runs a definite course like the exanthemata. It is most active in its first and second stages.

In two or three instances I have met with the disease occurring a second time, and such is also the experience of other observers. A lady, whom I have seen professionally for many years, assures me that she had whooping-cough when a child, and a second and very tedious attack when over forty years of age. The late Sir John Forbes had an attack of whooping-cough about a year before his death. Dr Easton, has kindly furnished me with the details of two very remarkable cases that came under his care. The first case was that of a gentleman in his seventy-first year, who resided in the west end of London. On April 14th, 1869, Dr Easton was consulted. He ascertained that the patient had had a cough for a week, which resisted the usual domestic remedies. The cough increased in frequency and severity, and on the 18th he first whooped distinctly. On the 11th of May he was well enough to leave town. During the attendance he had shown unmistakable symptoms of whooping-cough, the paroxsyms occurring very frequently, and being often followed by vomiting. On April 24th, whilst in attendance on this patient, Dr Easton was summoned to see Mrs P—, in her 94th year, the mother of the above. She had been in the habit of receiving daily visits from her son, from whom she no doubt had caught the disease. She had a spasmodic cough, which gradually increased, and in a few days she had also well-marked symptoms of pertussis. The cough continued until the 24th of May. These patients had not previously suffered from the disease to their knowledge.

As to the *nature and origin* of the disease, a wide difference of opinion prevails. Trousseau and some other writers regarded the disease as catarrhal in its nature, and M. Roger classified it with fevers in consequence of its contagious character, its separate stages, its epidemic prevalence, and the rarity of its recurrence. In the earlier stages of simple and uncomplicated cases, nervous irritation holds a very prominent position in the chain of causation, and this appears to be the opinion of most writers. Some have ascribed the source of mischief to the stomach, others to the lungs, and others, again, to the phrenic and pneumogastric nerves. Dr Copland attributed the seat of irritation to the medulla oblongata and base of the brain, whilst by some, the nervous system generally has been considered at fault. That in many cases the pneumogastric nerves are the seat of great irritation, and that the brain is involved through the medium of the sympathetic, is certain; but whether they are primarily or essentially concerned in the production of the peculiar phenomena appears to me doubtful. Whooping-cough depends on a materies morbi in the blood, a peculiar virus or poison which is active and highly infectious; it has a special affinity for the larynx and organs of respiration.[*] It has a tendency to throw the muscles of the glottis into violent spasm, through irritation of the inferior laryngeal nerves, which not only prevents the expulsion of the mucus so largely secreted by the windpipe in this affection, but by the violence of the coughing, and the extension of the irritation to the main trunk of the pneumogastric, affects the stomach and causes vomiting. A bacillus has been described as occurring in the sputa by Dr Burger, of Bonn, and which he says is peculiar to whooping-cough, but further observations in the same direction are needed before we can attach any importance to the discovery.

The *latent or incubation-period* may last from one to three weeks.

The disease may be said to have three stages:

1. *The catarrhal.*
2. *The spasmodic.*
3. *The terminal or last stage.*

1. *The catarrhal stage* is usually ushered in with most of the symptoms of a common cold, such as languor and febrile disturbance; but it should be borne in mind that the spasmodic stage may sometimes precede it and the whoop be heard before any bronchial irritation can be detected. The child is peevish and restless at night, the nose furnishes a slight discharge, and sneezing and tickling cough soon succeed. It is the severe and paroxysmal character of the cough during this period, with a persistent restless and feverish state, that suggest—in the absence of genuine bronchitic symptoms—the approach of pertussis. The cough for some days

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[*] The Registrar-General includes whooping-cough among the principal diseases of the zymotic class. Like smallpox, measles and diphtheria, scarlet fever and typhoid fever, its prevalence is sometimes great and fatal. Thus, of 1322 deaths registered in London for the week ending May 22, 1875, 2 died from smallpox, 23 from measles, 31 from scarlet fever, 14 from diphtheria, 91 from whooping-cough, 25 from different forms of fever, and 15 from diarrhœa, so that of these 201 deaths from zymotic diseases, nearly half arose from fatal cases of whooping-cough.

may be ringing, frequent, and irritating; but there is neither distinct whoop nor expectoration. There is hyperæmia of the bronchial mucous membrane and increased secretion of mucus. Until the whoop occurs we are in ignorance as to the nature of the disease.

The average duration of this stage has been put down at 12·7 days from a comparison of fifty-five cases by Dr West. In nineteen of them, the first whoop was heard within seven days of the commencement of the catarrh, but the premonitory stage may vary from two to thirty-five days.*

2. *The spasmodic or characteristic stage* is recognised by an increase in the frequency and severity of the cough, and a change in its character. The fit of coughing is painfully prolonged and spasmodic; the little sufferer opens his mouth wide as though he were choked; there is an attack of vomiting with it, and the escape of some phlegm and mucus from the air passages. Before the seizure comes on, the child seems as if he were inwardly struggling to suppress it, and he has a very anxious aspect. When the cough once really begins, the eyes are swelled and bloodshot, and tears run down the cheeks; the lips are bluish, and the face has a pallid, bloated look; the veins of the forehead and neck are distended, owing to temporary arrest of the circulation through the lungs, the pulse and respiration are much increased in frequency. After the fit is over, the child looks about astonished and vacant, as if something had happened and he did not know what. The cough often produces headache from congestion of the brain, and the child is heavy and stupid after it.

When the cough is very severe blood may come from the mucous membrane of the mouth, pharynx, posterior nares and bronchi, owing to the turgid and congested state of the mucous membrane. In consequence of the extreme distension of the capillary blood-vessels, they rupture. Hæmorrhage, indeed, from the mouth during the congestive stage, is extremely common, and will recur for weeks together in some cases.

Epistaxis is of frequent occurrence in a fit of whooping-cough, and if it be not copious and does not recur frequently it is of no consequence. If it does happen often, the blood becomes less fibrinous or plastic, leading to anæmia and exhaustion, so much so, that in very young children convulsions are not an uncommon result.

Occasionally hæmorrhage takes place *within* the cavity of the tympanum, precisely in the same manner as it does from the mouth, nose, and eyes. If the blood remains long unabsorbed, suppuration may ensue, and even ulceration of the membrani tympani as in scarlatina.

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* Op. cit., p. 410.

Hœmoptysis sometimes occurs, and generally speaking need not cause any anxiety.

Trousseau speaks of "*subcutaneous ecchymosis*" in a fit of whooping-cough. He describes the case of a little girl who had "an extravasation of blood into the subconjunctival cellular tissue, and into the cellular tissue of the eyelids, which passed through the ordinary stages of resolution, and successively stained the affected parts of a dark red, a violet-red, a brown, and a greenish yellow colour."* In 1878 a boy, 11 years of age, of robust frame, came under my care with whooping-cough. From the extreme violence of the paroxysms, a large effusion of dark blood took place in the left anterior chamber of the eye, only leaving a mere speck of the white sclerotic at its upper part. There was considerable bronchial irritation, and some recent emphysema.

Attacks of whooping-cough are usually worse at night, and when they come on the child may get out of bed alarmed, and in terror run round the room. Sometimes it cannot lie down, from fits of suffocative cough, nor get any rest. It is not unusual to meet with a child suffering from most of the physical and general signs of bronchitis in whom the poison of whooping-cough is not suspected, because the whoop has not been heard. This cough may last when the bronchitis improves, and be attended with violent and continuous expiratory efforts, when the look of the child's face and the nature of the cough (coming on in paroxysms, especially at night) are characteristic of pertussis. Nothing is absent but the whoop. This may develop itself further on, or never be completely developed at all; but the disease is the same, and in all other respects runs its course in the usual way. I have occasionally met with a case where one child in a family whooped, and the others, who presumably suffered from a similar cough, did not whoop; and I have known the pulmonary symptoms gradually assume the most serious aspect, while the whoop has declined, even if it has not been altogether absent.

The dread of coughing, or the fear of lying down to sleep, or a fit of passion or crying, is quite sufficient to bring on a paroxysm. The cough consists in a number of expirations, and when the child has seemingly forced all the air out of the lungs (and a considerable quantity is expelled) the effort is succeeded by a long and deep inspiration. As the air passes through the glottis the peculiar sound or whoop is produced, and this sound is liable to great modification. In a little girl, under my care in 1874, the inspiration was very clear and lengthened, fading away gradually like the sharp, shrill note of a flute. In other cases it is more barking and crowing. If bronchitis be not present in the convulsive or spasmodic stage, we may detect no physical changes in the lungs beyond a slight mucous râle. Between the fits of coughing the vesicular murmur may not be impaired, and air may enter the minute structure of the lungs, as in health; but during the fit of coughing the lungs empty themselves of air, and none whatever can be heard to enter the pulmonary tissue. When the expirations are long and continuous the child is brought to the verge of suffocation.

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* 'Clin. Med.,' vol. i, New Syd. Soc., p. 671.

In ordinary cases of uncomplicated whooping-cough, the child is quite well in the intervals of the cough, and although eating may excite a paroxysm, followed by vomiting, it will ask for more food as soon as the fit is over, and play with its toys, as in health. In the decline of the disease when the fits of coughing are less severe and frequent, exposure to cold, over-fatigue or excitement of any kind, are sufficient to bring on a relapse, and the cough which has nearly ceased now returns with all its former severity.

A good deal has been recently written on the connection of ulcers of the frænum linguæ with whooping-cough. I have examined a large number of cases, and I am inclined to agree with those observers who regard them as accidental rather than pathological. When present, they prove the violence of the convulsive paroxysms. As the tongue is protruded from the mouth, its under surface and the frænum linguæ come in contact with the lower incisor teeth, so that these ulcers may be looked upon as the result of injury. They are absent in mild cases, or where the duration of the disease is short, or the lower incisor teeth are not developed. M. Roger says the sublingual ulceration is only produced after violent "*kinks*," and is a sign of intense whooping-cough.

The cough of some children when suffering merely from a common cold is convulsive and ringing; in some it has a deep and sonorous sound, which parents attribute to a consumptive origin; and in others it has a croupy character, which they think is the forerunner of croup; but the whoop, when present, is not to be mistaken, and settles all doubts as to the true nature of the disorder.

When whooping-cough has succeeded to the eruptive diseases, or has followed any acute illness, or long-standing debility, it is difficult to treat and dangerous in its results. When a child has no sooner recovered from measles than he is attacked by whooping-cough, the two diseases greatly aggravate the danger.

Complications.—The nervous system may be involved at the onset of the disease or in its decline. In frequency it comes next to bronchitis and pneumonia. The repeated paroxysms of coughing induce congestion of the brain, which in very young children, particularly during dentition, is often followed by convulsions and fatal coma. Convulsions may arise in the course of whooping-cough, not from the amount of congestion or hæmorrhage that may be present in the brain, but from nervous excitability. Nervous symptoms are more readily excited in some children than in others, and these cases are always anxious ones, in fact, nervous irritation exerts a powerful influence in this disease. Dr Barnes, speaking of the influence which peripheral irritation has upon the nervous centres of a naturally irritable child, mentions a case of tetanus induced in an infant by whooping-cough.* In some few cases, acute meningitis is lighted up, and this grave cerebral mischief may be suspected if vomiting be frequent, and the stomach too irritable to retain food.

Diarrhœa is another complication never to be disregarded, as it rapidly reduces the strength, and in very young or delicate children may prove fatal in a few days.

Unless complications arise, such as bronchitis, pneumonia, diarrhœa, cerebral or mesenteric disease, whooping-cough is not dangerous. Although the disease may pursue a tedious course, and cannot be abruptly terminated by any method of treatment with which we are acquainted, it will sooner or later end in complete recovery, if these complications can be warded off.

The tracheo-bronchial glands not unfrequently become enlarged in whooping-cough, as they sometimes do in the course of scarlatina and measles. The theory advanced by Dr Gueneau de Mussy is that whooping-cough is an affection of these glands, and that by their pressure on the pneumogastric nerves, and particularly on the inferior laryngeal branch, the peculiar spasmodic cough is due.* He believes that there cannot be well-marked whooping-cough without enlargement of the bronchial lymphatic glands. But it is important to remember, as Dr Barlow very truly states, that enlargement of the bronchial glands in whooping-cough is not constant, and that they may be enlarged without paroxysmal cough.†

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* Lumleian Lectures—"On Convulsive Diseases of Women," 'Brit. Med. Journ.,' April 19th, 1873, p. 424.

3. *The terminal or last stage* may be described as the decline of the complaint. The cough is no longer so paroxysmal, the sputa are thicker and more easily expectorated, and there is no vomiting. The child sleeps soundly at night, as convalescence is approached, and gradually gains flesh and strength. Dr West estimates the average duration of whooping-cough at ten weeks.

Morbid anatomy.—No appearances are met with after death in whooping-cough characteristic of the disease. The most frequent changes are found in the lungs and in the brain. The mucous membrane of the nasal passages and of the bronchi are injected from over-distension of the blood-vessels, and in some cases, where bronchitis or pneumonia has been present, the usual appearances will be found. There is much mucous secretion in the air tubes, and as a consequence of the inflammation the bronchi are greatly dilated. Collapse of the lung has been often observed. Emphysema of the lungs is not uncommon, owing to the violent *expiratory* efforts in coughing, for the glottis being closed the air is driven against the upper portion of the lungs and their free edges. The brain and membranes in fatal cases are found congested, and there is some effusion into the lateral ventricles. Some writers have mentioned redness and softening of the pneumogastric nerves, but these changes are extremely rare. Out of twenty-four examinations of children dying of whooping-cough, Dr West only met with an alteration in one case, and here both nerves were redder than natural.‡ I think it must be conluded that where such a change occurs it cannot be relied upon as having any relation to the disease.

Treatment.—Few diseases are more rebellious to treatment, whether in the acute or chronic stage, and nothing would be more presumptuous than to lay down any plan for general adoption.

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* "Enlargement of the Bronchial Lymphatic Glands with relation to Whooping-cough," 'Brit. Med. Journ.,' 1879, vol. ii, p. 649.

† Ibid., p. 889.

‡ Op. cit., p. 432.

Whooping-cough, like many other diseases, must be treated on general principles, for we know of no real specific. The weakly, strumous child, whose disease is complicated with a pulmonary or a cerebral affection, must not be subjected to the same treatment as a strong and healthy child, for whooping-cough is modified by the strength and constitution, by the age, and by the season of the year. When catarrhal or inflammatory symptoms prevail, or general bronchitis is present, our plan of treatment is obvious. If convulsions or threatening symptoms of hydrocephalus should supervene it is equally plain; but to mitigate suffocative attacks of spasm, and to cut short this painful disease, we have no remedy on which we can confidently rely.

In the *catarrhal stage* cooling aperients and saline medicines are required. A mixture containing nitrate of potash, tincture of hyoscyamus, ipecacuanha wine, and the solution of acetate of ammonia will be useful. If the febrile symptoms are considerable, and the bowels disposed to be obstinate, a few grains of sulphate of magnesia may be added to each dose. Sometimes it is necessary to give a good purge, and after it the child is lighter and better. A grain of calomel, and a few grains of scammony or rhubarb, will now and then do great good by emptying the bowels and subduing the fever. The child should be kept in one room at a temperature of 60°, and the food consist of milk, barley water, and light beef tea.

When the disease sets in with bronchitis, dyspnœa, and much fever, and there is an accumulation of phlegm in the air tubes, an emetic should be given and repeated if necessary. The spasmodic cough, and constant expectoration reduce the child's strength much quicker than in uncomplicated bronchitis. The child is now apt to become heavy and torpid, and after a fit of coughing and sickness to fall into a drowsy state from congestion of the brain. When the lips swell, the eyes are heavy and meaningless, and the face becomes bloated from violent coughing and bronchial congestion, it may be necessary to apply two or three leeches to the head, and give a grain of calomel, followed by a soap and-water-enema, if the bowels do not quickly respond.

As the febrile disturbance diminishes, the nervous prostration and harassing cough are sometimes very troublesome. In this condition, carbonate of ammonia and spirit of chloroform are necessary to aid the expectoration (Form. 61); but so long as there is much irritation in the lungs, we must be careful in the use of sedatives, as I have previously mentioned. In some cases, the child becomes much exhausted from the violence of the cough and the copiousness of the expectoration; the skin becomes relaxed and sweating, a state of passive congestion of the whole surface ensues, and stupor and drowsiness set in. Here the exhibition of sedatives would be dangerous, and in place of them we must give ammonia and bark, and supply the child with nutritious food in small and repeated quantities.

When the strength is fairly good, and the patients are harassed by perpetual cough and glairy tenacious mucus, an emetic will be useful, but the treatment requires judgment, lest we weaken the digestive powers and lay the foundation for convulsions or some other serious complication. Usually one dose is enough, and the patient falls into sound sleep after it. I have seen the greatest advantage follow a bromide mixture with belladonna given three times a day, and an emetic at night. This plan of making the child sick is of less use if the minute bronchi are choked up, and there are any signs of impeded circulation through the heart and lungs, but it is of especial value where the upper bronchial tubes are loaded, and the larynx is congested and irritated. Gentle emetics will aid the expulsion of morbid secretions, subdue the cough, moderate the fever, and rouse the child from stupor and lethargy. If the child has been overdosed with narcotics this treatment will be the more serviceable.*

Diet is of the first importance in the treatment of whooping-cough. It should be light and nutritious. Egg pudding, beef tea, and milk are the chief kinds of food to be chosen, because they are digestible and non-irritating. Bread may be given soaked in milk; but a small piece of plain bread and butter will often provoke a fit of coughing. Minced mutton and chicken in very small quantities, are suitable for children of a certain age. Barley water, sweetened and flavoured with lemon, is an excellent mucilaginous drink. The stomach is very sensitive, and the nervous system so impressible in this disease that improper food, cold air, or deficient clothing, will be sure to aggravate the complaint. A child should always be fed immediately after an attack of cough accompanied by vomiting, so that the food may be digested and assimilated ere the next paroxysm comes on. If this be not attended to, the food is apt to be vomited in the next attack in a partially digested condition, and so is lost for all purposes of nutrition. As far as possible the most perfect rest of body and mind should be maintained.

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* See the action of emetics in Chaps. II and XXXV.

Counter-irritation is sometimes of advantage. If there is much bronchial irritation and dyspnœa and restlessness at night, a linseed poultice with mustard in it will often have an excellent effect, and it may be repeated as often as it seems necessary. Friction of the chest and spine with a soap and camphor liniment, enough to redden the skin, may be resorted to with advantage. Blisters are scarcely to be recommended.

The late Dr Fuller tried sulphate of zinc, in gradually increasing doses, to subdue the spasmodic cough, and in five only of fifty-nine cases did it fail in giving marked and speedy relief. In no instance did the disease last longer than the eighth week.* He was in the habit of prescribing sulphate of zinc and belladonna as soon as the whoop declared itself. The dose was gradually increased till the child, according to its age, took daily from six grains to one drachm of the zinc, and from two to six grains of the extract of belladonna. I have never prescribed these remedies in such large doses, but in moderate quantities and in suitable cases the combination is sometimes very serviceable.

Belladonna deserves to rank among the first of our remedies in the treatment of this affection. The excitement and frequency of the cough are allayed by it in a marvellous manner. Large doses of belladonna are well borne by children. But it is important to increase the dose slowly, and if excitement, feverishness, or bronchial engorgement should ensue, then salines and emetics may be called for. A fatal case of belladonna poisoning is recorded in a child five years of age, in which the temperature a few hours before death rose to 110.° †

I have met with few instances where belladonna has not proved of benefit, none where it has appeared to do harm. It is of most use in the spasmodic stage, when the bronchial irritation has subsided. I usually begin with a quarter of a grain for a child aged two years, in glycerine or syrup of tolu, every four hours. If it has no effect I give the same dose every two hours until it has made an impression upon the system. In one case I found that the spasmodic cough was uncontrolled till the child, aged eight years, took one grain every three hours. After a few doses the pupils became dilated, the cough lessened, and the child obtained refreshing sleep. Belladonna is a valuable remedy in allaying spasmodic or convulsive action, not only in the whooping-cough of children, but in other forms of convulsion. But, as I have pointed out, if it is to be of service we must give it in gradually increasing doses till its sedative effects become manifest, and the pupils are fully dilated. Then the dose should be reduced, especially if there be thirst and dryness of the throat. Like some other remedies employed in this intractable affection, it has obtained no credit, and been looked upon as inert and valueless. This is because the dose given is too small. I can have no doubt of the value of the drug, and at one stage or another I almost invariably give it. It lessens the frequency and severity of the spasmodic attacks, and subdues the tendency to convulsive movements. When its action has been kept up, and especially when combined with bromide of potassium, it tranquillizes the nervous system, induces sleep, and relieves the cough.

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* 'Diseases of the Lungs,' 1867, p. 384.

† 'Brit. Med. Journ.,' 1882, vol. ii, p. 579.

Bouchardat prescribes atrophia with white sugar in the form of a powder (Form. 56a).* In the catarrhal stage it may be given with ipecacuanha wine, and bicarbonate and nitrate of potash,† or when the catarrh is slight and the cough violent, with nitric acid.‡ Dr H. C. Wood says that the sixteenth of a grain of atrophia given hypodermically is the best method of administering belladonna where rapidity of action is required.§

Cannabis indica is recommended by some practitioners in the spasmodic stage. One drop of the tincture in a teaspoonful of water, may be given three or four times a day for each year of the child's age.

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* Form. 56A:
℞ Atropiæ Sulphat. gr. $\frac{1}{8}$
Sacch. alb. ʒij
} M. A grain and a half to be taken three times a day.
For children from five to seven years of age.

† Form. 56B:
℞ Atropiæ Sulph. gr. $\frac{1}{150}$
Vini Ipecac. ♏v
Potass. Bicarb. gr. vj
— Nitrat. gr. iv
Syr. Tolut. ʒss
Aquam ad. ʒij.
} M. To be taken three times a day.
For children from five to seven years of age.

‡ Form. 56C:
℞ Atropiæ Sulph. gr. $\frac{1}{150}$
Acid. Nitric. dil. ♏iij
Syr. Tolut. ʒss
Aquam ad ʒij.
} M. To be taken three times a day.
For children from five to seven years of age.

§ H. C. Wood, M.D., op. cit., 1876, p. 257.

Hydrate of chloral has done good in the spasmodic stage, and relieved the cough, even when ipecacuanha and belladonna have failed. Five grains every four hours may be given to a child five years of age.* I have combined it in smaller doses with bromide of potassium.

Croton-chloral has been spoken of as a specific.†

Bromide of potassium, like belladonna, is of most value in the spasmodic stage; and if convulsions or much nervous irritability should complicate the condition, it will be all the more serviceable. When there is much bronchial congestion and secretion it should be held in reserve, and not given till the lungs are freed of this load of phlegm by an emetic; but a moderate amount of catarrh and bronchitis do not contra-indicate its use.

In whooping-cough when the breathing is excited, bromide of potassium as a sedative to the respiratory centre is indicated. On the other hand, when the respiration is laboured or shallow, then belladonna is the drug to use as a stimulant to the respiratory centre.

When a paroxysm of whooping-cough is about to commence, the head should be elevated, and the child raised up if in bed. Everything about the neck and breast should be loosened. If the child is old enough to understand what is said to him, he should be encouraged and reassured. The temperature of the room in the early stages requires to be warm and elevated, as in cases of bronchitis. The tenacious mucus must be wiped from the child's mouth with a handkerchief; the distress and alarm caused by the little patient's attempt to dislodge it is characteristic, and, from the fear induced, the paroxysm is often prolonged, and the child much exhausted.

Alum has been considered of benefit by some authorities in the spasmodic stage of uncomplicated whooping-cough; but I have been so satisfied with belladonna that I have seldom employed it. When all fever has departed, or the complaint has become chronic and irksome, it may be given with syrup three or four times a day, in doses of three or four grains. When the bronchial mucous membrane furnishes a copious secretion (bronchorrhœa), and the child is getting weak from the cough and sickness, alum seems to act both as an astringent and tonic, lessening the frequency and severity of the paroxysms without causing constipation or any ill consequences. Combined with belladonna, Meigs and Pepper have obtained better results than with any other remedy. They prescribe the undermentioned formula.[*][†]

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* "Hydrate of Chloral in Pertussis," Clinical Lectures on Medicine by Dr Murchison, 'Lancet,' Oct. 29th, 1870.

† 'The Lancet,' 1877, p. 223.

I have never tried nitric acid in the doses recommended by the late Dr Gibb, but I have frequently given in the decline of the complaint, the nitro-muriatic acid alone, or with tincture of bark, to improve digestion and appetite. Much in the same way, and in the same states, we should prescribe iron.

I have rarely given hydrocyanic acid alone. Its specific action is best seen in controlling the severity of the paroxysms and the frequency of the convulsive cough. Its sedative action on the gastric nerves may also have a beneficial effect in allaying the irritation of the digestive organs, and diminishing the general sensibility of the nervous system; but it will have little or no effect on the cough, if the irritation depends on the accumulation of phlegm in the air passages. Here it may be necessary to give an emetic in the daytime as well as at night. To be of service hydrocyanic acid should be given frequently, according to the severity of the spasm and the frequency of the cough. It is a remedy that requires careful watching, for an overdose may produce syncope or convulsions, and it is for this reason that I seldom prescribe it.

But amongst medicines used in whooping-cough the old-fashioned remedy of carbonate of potash cannot be ignored. The testimony that has been urged in its favour is very strong. It is of most service when the secretions in the larynx are tenacious, and adhere to the parts about the glottis, so that they cannot easily be dislodged by expectoration. The alkali is of service here, as it is in the early stages of bronchitis, when the bronchial membrane is vascular, secreting, and irritable. It controls the violence of the paroxysms which so terribly exhaust the child, and it enables the copious secretion about the air passages to be more easily dislodged.

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[*] Form. 57.:

℞ Ext. Belladonnæ gr j
Aluminis ʒss
Syr. Zingib.
— Acaciæ
Aquæ āā ℥j.

M. ʒj four times in the twenty-four hours.
For a child a year old.

[†] Op. cit., p. 276.

The cochineal usually combined with the potash mixture is probably of no value, but it is pleasant to the eye, and with syrup will not be refused by the youngest child.[*]

When the whoop is declining, and the febrile symptoms are departing, hydrocyanic acid and quinine are good remedies, and may be given with advantage, even when there is some rhonchus in the lungs, and a little moist crepitation. In three children in one family, who were all seized with whooping-cough about the same time, I found that in each case the frequent and spasmodic cough were rapidly relieved by this treatment, and they were able to digest sufficient nourishing food to strengthen the general system and shorten the duration of the disease. At the end of a week or fortnight, the signs of pulmonary irritation may all disappear, and cod-liver oil and preparations of iron will then complete the cure.

As to the topical application of remedies to the larynx in this intractable disorder, I have had no experience. Sponging the pharynx with a solution of nitrate of silver was long ago advocated by Dr Eben Watson, of Glasgow, Dr Horace Green, of New York, M. Joubert, and some other French physicians. Dr Watson applied it successfully to a baby at the breast, whose life was in danger, and he has given some statistics to show that of sixty-six cases treated by him, forty-six were cured in a fortnight, and the remaining twenty in three or four weeks. Not one child resisted the treatment. In another calculation, from a severe epidemic at Glasgow, he gives the proportions of deaths at only 0·6 per cent., and the cases cured within a month were 36·5 per cent.[†] There would seem to be something extraordinary in the rapidity of these cures, because, looking at the experience of most writers on the subject, the duration of the disease has generally been much longer. A disease that may end in a fortnight, or extend over six months, pursues such an indefinite course that no reliable calculation can be made. If the application of a solution of nitrate of silver (℈j to the ℥j) is such a valuable remedy we are somewhat surprised to learn that it is not more generally adopted. It appears to me that sponging the pharynx and aperture of the glottis may give relief, in the purely spasmodic stage, to children of six or seven years of age; but to pass the sponge beneath the glottis into the larynx, which is the only way to act on the secretion which sets up the spasm, must be attended with difficulty and danger. The larynx is very small in young children, and it would require considerable skill to enter it. Then, too, the alarm and agitation produced by the operation, are quite enough to increase the spasm, if not to provoke a convulsion.

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[*] Form. 58:

℞ Cocci gr. v
Potass. Bicarb. gr. xl
Syrupi ℥ss
Aquam ad ℥iv.
M. A dessert-spoonful every three or four hours.
For a child two years old.

[†] 'On the Topical Medication of the Larynx,' by Dr Eben Watson, 1854, chap. vi, p. 108.

Steam inhalations of hot water are of great service in all irritable and inflamed conditions of the trachea and large bronchi. But no remedy equals carbolic acid in whooping-cough. One part of the acid is mixed with sixty to eighty parts of water at 120°, and this is put close to the child's bed, and from time to time brought as near the mouth as possible. The room soon becomes thoroughly impregnated with the odour of the acid, so that the child is constantly breathing it. The vulcanite spray producer can be used easily for children from three or four years of age, but younger children are apt to be frightened.* The tube is inserted between the teeth as far back as possible into the mouth, and the bellows is briskly pressed with the hand. I have obtained most excellent results from the use of carbolic acid, and seen cases apparently hopeless recover completely and quickly when other plans of treatment have failed. Dr Burchardt states that in 1873 he used a solution of carbolic acid in water for inhalation three times a day (one and a half to two parts of acid in a hundred parts of water) with perfect success in the treatment of whooping-cough, and other affections of the respiratory organs.† Constitutional remedies are to be diligently employed with the carbolic acid inhalation.

When the paroxysms are frequent and severe, and the nervous system is much excited in consequence I have sometimes put children under the influence of bichloride of methylene with apparently good effects. If this be done on the approach of a paroxysm it will either arrest it altogether or mitigate its severity. It requires judgment in its administration, care being taken not to push it to the full extent of narcotism, and not to have recourse to it except the attacks have resisted other measures. Enough must be given to relax the muscles, when the cough will subside. If Junker's apparatus be used, and the operation be conducted carefully and slowly, the child may be got under the influence of the anæsthetic without struggling, or the feeling of suffocation. If there is much bronchial irritation, or mucus in the air passages, the anæsthetic is contraindicated. As there is risk in the use of the remedy the parents should be told of it, and then if death took place from convulsions, or spasm of the glottis, no blame could be attached to the practitioner. As just mentioned, however, carbolic acid inhalation is safer and more lasting in its effects: the one is curable, the other only arrests the paroxysms, and quiets the child for a time.

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* See Chap. IX, on "Scarlet Fever," p. 93.

† 'Brit. Med. Journ.,' vol. i, 1875, p. 396.

It should not be forgotten that we are dealing with a disease presenting so many local and constitutional variations—spasmodic, congestive, and inflammatory—that no specific treatment and no medicated inhalation will be suitable for every period and stage of the complaint.

In the neurosal stage, quinine and bromide of potassium are very useful.* And sometimes quinine in full doses answers remarkably well. To a child a year old, one grain may be given three times a day, with a minim of dilute nitric acid and a little glycerine and water. We must never forget to keep the salient points before us—the neurosal side is the essential factor in one case, the pulmonary or bronchitic in the other.

Any error of diet, and especially over-feeding, fatigue, or exposure to cold, will bring on a return of the symptoms when the whooping has entirely disappeared, and we have pronounced the patient cured. The peculiar cough may recur after three months' cessation when convalescence has been interfered with.

For the cough which remains as a consequence of general debility and weakness of the nervous system, quinine and the liquor cinchonæ are useful. If anæmia be present some preparation of iron, as the syrup of the phosphate, Fellow's syrup of the phosphate, reduced iron, or the ammonio citrate will be found very valuable and remove the cough altogether.

Change of air and locality are very serviceable, and will sometimes effectually get rid of the remaining cough in a short time. In some cases change appears to be attended by no advantage, but it should always be advocated as soon as the disease becomes chronic, and has proved rebellious to treatment. Seaside air often brings about a rapid improvement. If the general health keeps fairly good, and no complications arise, a nutritious and careful diet, with an occasional aperient, is only demanded till the malady wears itself out.

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* Form. 59:
℞. Tinct. Quiniæ ʒij
Potass. Bromid. gr. xl
Glycerini ʒss
Aquam ad ℥iv.
M. A dessert-spoonful three times a day.
For a child five years old.

CHAPTER XXXII

ENLARGED BRONCHIAL AND MEDIASTINAL GLANDS

CAUSES—*Unfavorable hygienic conditions—Cold and exposure—The exanthemata—Evil effects of over-feeding.*—SYMPTOMS—*Bronchial irritation and attacks of dyspnœa resembling spasmodic asthma—Cases in illustration—Post-mortem appearances.*—TREATMENT—*Expectorants and sedatives to relieve cough and dyspnœa—Preparations of iron and cod-liver oil—Application of a weak solution of tincture of iodine to the enlarged glands.*

CLOSELY associated with the morbid changes in connection with hypertrophy of the mesenteric glands are those similar changes observed in the bronchial and mediastinal glands. The constitutional condition which originates the complaint in both sets of cases is similar; but as the symptoms are necessarily different and often obscure in the latter, I shall devote a separate chapter to the consideration of them.

Below the bifurcation of the trachea, in the angle formed by the divergence of the two bronchi, from ten to fifteen lymphatic glands are situated, varying in size from a small pea to that of an almond; glands also exist along the course of the bronchi, chiefly behind them.

In health these glands are proportionately larger in infancy than in the adult.

Being lymphatic organs, these glands are subject to the same diseases that attack their homologues in other parts of the body, as for example, that simple strumous enlargement so common in the glands in the neighbourhood of the sterno-mastoid muscles. They are liable to 1, congestion; 2, hypertrophy; 3, acute inflammation; 4, chronic inflammation. Congestion is prone to terminate in chronic hypertrophy. Both forms of inflammation occasionally cause abscess, leaving a sac or cyst containing pus or cheesy matter. But from their situation, any enlargement of the bronchial glands entails the risk of grave mechanical results. Pressure on the bronchus, on branches of the great vessels of the lung, or on the pneumogastric nerve, cannot fail to affect most seriously the processes of respiration and circulation. As glands exist in the mediastina, they may from their situation cause, when diseased, complications almost as severe as when the lymphatics of the bronchi are involved.

Causes.—Lymphatic enlargement in the mediastinum and around the bronchi is produced by similar causes to those of swelling in the glands elsewhere. Thus, unfavorable hygienic conditions, debility, starvation, or neglect, may induce the disease under consideration. Cold and exposure are common exciting causes of congestion of these glands, or disease may be provoked by the glands participating in the inflammation of surrounding tissues with which they may chance to be connected. During whooping-cough, the exanthemata, and typhoid fever, the bronchial glands are apt to become enlarged. The disease may be met with during the first dentition; it is intimately connected with struma and tubercle, and the hypertrophied glands undergo caseous degeneration, or even abscess and suppuration. I have seen it in connection with rickets, acute tuberculosis, and emphysema.

Its frequency in early life is admitted by nearly all authorities on the subject, and females are more liable to the disease than males.

Dr Goodhart has insisted on the evil effects of over-feeding in association with enlargement of the mediastinal glands. He shows that this enforced intemperance with regard to diet not only produces disease of the alimentary canal, but "does harm in another way; by over-stuffing the lymph glands, giving them more than they can do; choking them with their own materials, and leading directly to tabes mesenterica, bronchial glandular enlargement, and even, I believe, to a general disease in the glandular elements in many parts—a process which at its onset is more aptly compared to stuffing turkeys or geese than to any strictly pathological condition."*

The physiology of nerve stimulation and reflex action is complex, and in no respect can be more complicated than with regard to the functions of the nerves controlling respiration. It is now considered probable, that the grave reflex results due to this disorder are not invariably confined to spasm of the laryngeal muscles. The mischief appears to lie in the bronchioles and the lung itself, a condition closely allied to what we suppose to be the case in spasmodic asthma. With the knowledge of this fact, the practitioner becomes aware of the futility of attempting tracheotomy in ordinary cases of enlargement of the bronchial glands. But hard-and-fast rules cannot be founded on physiological hypotheses. In very severe and sudden fits of dyspnœa from the disease now claiming our attention, it may happen that a gland has ulcerated into the bronchus, become detached, and produced the same spasm of the glottis which follows the entrance of cherry-stones or other foreign bodies into the air passages. The well-known fatal case from this cause, in a boy aged eight years, described by Mr Edwards in the thirty-sixth volume of the 'Medico-Chirurgical Transactions,' and quoted in Holmes' 'System of Surgery,' might have recovered if tracheotomy could have been performed earlier.

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* "Cases of Enlargement or Inflammation of the Mediastinal Glands," 'Brit. Med. ourn.,' vol. i, 1879, p. 580.

On post-mortem examination, the appearances of the affected region are readily made out by any observer who has had a fair idea of the normal size of the bronchial and mediastinal glands. From their position (especially as regards those at the root of the lung) it may readily be seen to what extent they press on neighbouring vessels and nerves. Dr Goodhart, in one case, found the pneumogastric nerve firmly adherent to a diseased gland. The patient was a boy, aged eight, who died after suffering from severe paroxysms of dyspnœa for a fortnight. The same authority describes an autopsy where the thymus gland was found much enlarged. The patient, an infant eight months old, had been subject to convulsions and fits of choking. Irritation of the mediastinal nerves by the large thymus had probably exercised a considerable share in the fatal result. The trachea and bronchi may be ulcerated by pressure of the glands, and even plugged by them.

Symptoms.—Enlarged bronchial and mediastinal glands may give rise to cough of a short hacking or laryngeal character, or it may be spasmodic, resembling whooping-cough, causing lividity of the features, and threatening asphyxia. It may be like the cough of a sheep, and in one of my cases it exactly resembled that of a "Punch-and-Judy" squeak. Other cases begin with catarrh and febrile disturbance, which may last for a week, and then spasmodic cough and crowing inspiration ensue. The child cannot lie down in bed for fear of choking, and is in constant danger of suffocation. Sometimes pain is complained of on either side of the spine about the fourth or fifth dorsal vertebræ, or at the upper part of the sternum, and below the clavicles. The chief symptoms are those of bronchial irritation. Hæmoptysis, expectoration of mucus or pus, hoarseness, and loss of voice are sometimes present. In some instances the child seems as though it could not get breath, and dies of asphyxia. After death in such cases enlarged caseous glands are found in the mediastinum, and near the bifurcation of the bronchi. In the case of a child, two and a half years old, a large caseous gland had opened into the trachea, and caused death.* The mesenteric glands were also enlarged, and Peyer's patches were thickened, whilst the mucous membrane generally over this part of the ileum was thickened, and the glands were in a state of overgrowth. In another case, the thymus gland was very large, and where the inferior laryngeal nerve is given off from the par vagum there was an enlarged gland, the size of a "haricot bean," embedded in the surrounding fibrous tissue. The glands about the root of the lung and vagus were equally large, but not caseous.

An attack of difficult breathing, like asthma, may come on in the night, accompanied by lividity of the features, paroxysmal cough, staring eyes, painful anxiety, and end in death by coma. In such a case there may be caseous and suppurating glands, with broncho-pneumonia.

The *physical signs* in the majority of cases are dulness between the upper part of the scapulæ and spinal column and below the clavicles. The percussion note may be hyper-resonant when a cavity has formed from the breaking down of a gland. Diminished mobility of the chest walls, flattening of one or both sides, tubular breathing, and prolonged expiration are not uncommon. The following is a very instructive and interesting case, and the examination after death confirms the diagnosis which was made when the child first came under treatment.

C. J—, æt. 1¾, was brought to me on January 3rd, 1876, at the Samaritan Hospital, with the following history :—In September, 1875, he was seized with cough, breathlessness, and febrile disturbance, having been up to this time strong and well. The father and mother were healthy, and there was no phthisis in the family. The child was pallid, with grey eyes, light hair, and prominent forehead. He had sixteen teeth, which were decayed and ragged, and the gums were red and spongy. The thorax was thin and rounded, and the ribs were very prominent from loss of flesh; beneath both clavicles the percussion note was hyper-resonant, especially on the left side; posteriorly the note was tympanitic between the scapulæ at the upper part, and the breathing was almost cavernous between the spine of the right scapula and vertebral column, but there was no crepitation. I diagnosed an empty cavity in this situation. Temp. 102·6°; pulse 160, small; resp. 80, short and superficial.

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* "Cases of Enlargement or Inflammation of the Mediastinal Glands," 'Brit. Med. Journ.,' vol. i, 1879, p. 542.

The head was large, and the veins over the forehead and temples were distended. He was not admitted into the hospital, as his mother preferred keeping him at home. He was ordered a diet of milk and beef tea, and in the shape of medicine a mixture every four hours, consisting of carbonate of ammonia and tincture of cinchona, with syrup of tolu and water. On February the 3rd it was stated that he was better for a time, in consequence of the directions being carefully carried out, but he relapsed again yesterday afternoon, was hot, and had headache, sweating and perspiration of the scalp; the child had evidently been in great pain, judging from the rolling of the head to and fro. The mother stated that he was always feverish, with flushed cheeks in the evening; but the temperature was only 98°, pulse 132, respirations 56. Loud rhonchus and catarrhal sounds were heard throughout the chest, both in front and behind; there was loose gurgling heard over the suspected cavity or suppurating gland at the upper part of the left scapular region, close to the vertebræ. The child was very fidgety, irritable, and quarrelsome. Two grains of bromide of potassium were added to each dose of the mixture, and a teaspoonful of syrup of senna was given occasionally to keep the bowels open. When next seen on the 14th he had greatly improved; had had no feverish attack since the 6th, but his cough was very troublesome, and he was rapidly losing flesh; temp. 99°, pulse 132, resp. 48. The breathing, though quick, was easier, and more indicative of debility than pulmonary embarrassment; face very pallid, pupils large, eyes bright, skin of arms and legs loose, and both limbs much wasted. He was ordered to continue the mixture, and take a teaspoonful of cod-liver oil twice a day. On the 22nd the mother feared the child had whooping-cough, as his sister was suffering severely from it, though she had not heard him whoop;

he coughed up much phlegm of a stringy tenacious character. He was so restless and fretful that it was difficult to count the pulse. After some trouble I made out the temperature in the rectum 99·8°, pulse 140, resp. 52. The bromide was again increased to four grains three times a day. On the 28th it was reported that he had had no rest since last visit, and sometimes he seemed as though he would lapse into unconsciousness. Though he had not whooped, the cough was incessant and tearing, and perspiration poured off his head. The feet and hands were inclined to swell; the eyes had a staring and wild look, and the rolling motion of the head indicated cerebral trouble. There could be no doubt that whooping-cough was a complication. The following day he appeared better, and ate some pudding, shortly after which he was seized with a choking cough, turned rather dusky, and then died suddenly, without any sign of struggling.

Post-mortem examination (*24 hours after death*).—Body thin and pale, with livid marks posteriorly. On opening the thoracic cavity, the lungs were found to be approximated at the anterior borders, pallid, and very emphysematous, especially the upper lobes. At the upper and posterior portion of the right lung, close to the spine, where gurgling was heard when the child first came under notice, was a caseous, suppurating bronchial gland, from which about a teaspoonful of yellow cheesy matter was squeezed out; the entire half of this lung, when cut into, contained many semi-transparent grey granulations, and the whole lung tissue in this situation was pallid, and of a light rosy hue; many of the air-cells had ruptured. The left lung was more pallid and emphysematous; it contained here and there a few grey granulations and very minute cavities, irregularly and scantily distributed, some the size of a pin's head.

The pericardium contained some thin serous fluid, and the vessels on the outer surface of the heart were full. In the right ventricle was a clot of fibrine, as big as a small walnut, and some dark blood; to it was attached a cord of fibrine, six inches long, with a branch going into the pulmonary artery, and this might have been the cause of sudden death, although post-mortem clots are very frequent in this vessel. The kidneys, spleen, and mesentery were healthy, and no tubercle was detected. The liver was large, extending into the left hypochondriac region; no sign of tubercle.

The brain-structure was soft and pallid; it was considerably enlarged, and the sinuses at the base were very full and distended, but nothing like albuminous or sero-purulent matter was to be observed around any of the nerves where it is usually seen in meningitis, and no excess of fluid was present. The brain, however, was altogether more watery than usual. There was no tubercle anywhere, nor any fluid in the ventricles.

The immediate cause of death was probably the obstruction of the pulmonary and systemic circulations by the entrance of the clot into the pulmonary artery, and so the heart failed.

The next case, though it did not terminate fatally, illustrates all the clinical features of enlarged bronchial glands.

A. N—, æt. 4, was admitted into the Samaritan Hospital on October 29th, 1877. He had been ill three weeks with a bronchial attack and cough. On admission the temperature was 101°, pulse 132, resp. 34. After a purge and a saline mixture, the temperature fell to 99·4° in twenty-four hours, and two days later it was normal.

The cervical glands on the left side were so large that they obliterated the ramus of the lower jaw, and filled up the space in the neck. On the right side they were also large, but much less so than on the left.

The patient had a shrill, whistling, choking cough, but varied a good deal in character, being sometimes like croup, and at others resembling a "Punch-and-Judy" squeak. He was unable to assume a recumbent posture, but sat up in bed with his head bent forwards. His breathing was frequent and noisy, and wheezing was particularly loud after coughing or taking food. Over the upper sternum and along its centre the percussion note was very resonant. The resonance was impaired and the breathing weak under the clavicles. There were loud laryngeal moist sounds, the respiration was diaphragmatic, and the lower part of the sternum was drawn in at each inspiration. Posteriorly there was dulness over the upper lobes of the lungs, especially on the right side, between the spine and upper edge of the scapula; resonance was well marked below, but throughout there was rhonchus, mixed with large and loose crepitation. Sometimes the respiration was placid and noiseless, particularly in the daytime; but in the evening, or during the night, the breathing was occasionally difficult, and resembled an attack of spasmodic asthma.

The treatment consisted in giving the syrup of iodide of iron, cod-liver oil, and good diet. A weak solution of tincture of iodine was applied to the glands in the neck, and between the shoulders at the upper part of the scapulæ.

The condition varied a good deal for the first three weeks, but on the 28th of November the glands in the neck had much decreased in size, and although the face was bloated it was not dusky.

December 28th.—The child had in all respects improved; he was lively and cheerful, enjoying his food, and sleeping tranquilly at night. He could lie with his shoulders low, or on either side, without causing cough or inconvenience in breathing. The chest was everywhere resonant, inspiration was freer and longer, whilst expiration was much shorter, and there were no moist sounds to be heard, though there were was considerable rhonchus. Pulse 88, resp. 20. The diminution in the size of the glands in the neck was remarkable.

Caseous degeneration of the bronchial glands has been found in connection with tuberculosis of the lungs, as we have just seen. There is a case recorded by the late Dr Pearson Irvine, in which it was associated with tubercle in the lungs, brain, and kidneys. In a boy, æt. 7 years, "a tumour" was found beneath the thyroid body after death, as large as a walnut, the bronchial glands were swollen and caseating, whilst the upper lobes of both lungs contained grey granulations, some being small and translucent, and others larger and undergoing caseation. The lower lobes of the lungs and the kidneys also contained scattered tubercles. At the base of the skull there were about eight ounces of serous effusion, and near the posterior end of the falx cerebri "a mass about the size of a large Barcelona nut." There were no tubercles at the base of the brain, but they were numerous in the cerebrum, "varying in size from a marble to a small walnut," and they were also met with in the cerebellum. Notwithstanding these changes, this boy never experienced any cough from the beginning to the end of his illness.*

Another singular case is recorded by Dr Sydney Coupland,† in which a caseous mediastinal gland burst into the trachea, causing death in a paroxysm of dyspnœa. The patient, a delicate boy four years of age, was said to be "asthmatical" shortly after birth; later on, when two years old, he had "low fever," lasting seven weeks. When three years old he took cold, and suffered from alarming attacks of "shortness of breath," general bronchitis, and hoarse ringing cough. Under treatment he became convalescent, and left the hospital. Nine days later he was readmitted with bronchitis, and soon afterwards suffered from paroxysmal attacks of dyspnœa, inability to lie down, and lividity of the lips. During one of these seizures, Mr Morris performed tracheotomy, which quieted the breathing for a time, but in a month from the date of his re-admission another attack occurred, and the child died asphyxiated.

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* 'Path. Trans.,' vol. xxix, p. 11. It somewhat resembles Mr Edwards' case already quoted, page 354.

† Ibid., vol. xxv, p. 29.

On a post-mortem examination, there was found a collection of enlarged and indurated glands in the anterior mediastinum, mostly near the root of the right lung. In the posterior mediastinum there was a chain of enlarged glands, and above the right bronchus they had formed a mass of caseous matter. "On laying open the trachea, that tube was found to be occluded just above the point of bifurcation by a mass of cheesy matter extending into the right bronchus, and proceeding from the largest mass in the mediastinum, which had ulcerated through the trachea at this point, the aperture measuring nearly an inch along the axis of the tube, while, for more than half an inch above, the calibre of the channel was narrowed by the pressure of the gland from without." There was a cavity in the right apex, the bronchi were dilated, and the lung tissue was more or less solidified. There was some enlargement of the mesenteric glands.

Treatment.—This must be conducted on general principles. If there are indications of bronchitis or pulmonary congestion, they must be controlled by sedatives and counter-irritants; febrile symptoms demand salines and mild aperients (Forms. 7, 8, 12). Carbonate of ammonia, senega, and ipecacuanha should be selected to relieve cough and oppression in breathing (Forms. 61-66). When the case is not associated with any acute febrile disorders, as tubercle, whooping-cough, or measles, but only accompanies loss of flesh and strength, failing appetite and general wasting, then cod-liver oil, malt extract, and the syrup of the iodide of iron, are the remedies best calculated to afford relief.

When bronchial symptoms are present, and there is pain in the chest, the application of a small linseed poultice with a table-spoonful of mustard for a few minutes at bedtime may be necessary, the chest being afterwards protected with cotton wool. Another form of local application consists of a stimulating and sedative liniment, composed of equal parts of aconite and camphor liniment, or of belladonna liniment and spirit of chloroform, sprinkled on a piece of flannel wrung out of hot water, and applied under a folded towel or on spongio-piline. This will relieve pain in the chest when present, just as it will mitigate the suffering of sciatica in adults.

When the enlarged glands have passed into a chronic state, the application of diluted tincture of iodine (1 in 4) may be advantageously resorted to. It is remarkable how the hypertrophied cervical and bronchial glands sometimes become diminished in size under the persevering use of this valuable absorbent, combined with good diet, pure air, warm clothing, and such internal remedies as the circumstances of the case may appear to warrant.

CHAPTER XXXIII

ON ASTHMA

CAUSES—*Predisposing and exciting—Sometimes hereditary—Its neurosal origin—Follows whooping-cough, bronchitis, and measles—Association with eczema—An occasional sequel to scarlet fever—Sometimes excited by certain fungi—Odours of plants and animals—Irritation of dust, &c—Indigestion.*—SYMPTOMS—*Frequently comes on suddenly at night during sleep—Symptoms of a paroxysm—Rapid breathing—Anxious countenance—Inspiration short—Expiration prolonged—Duration of the fit—May begin with catarrh—Association with gout—Albuminuria.*—DIAGNOSIS—*General absence of fever—Suddenness of the paroxysms, and recurrence at uncertain intervals—Tranquil respiration between the attacks—Dyspnœa of asthma gradual and decline rapid—Cardiac dyspnœa always increased by exertion, and patient not so well after a seizure as after an asthmatic attack.*—PROGNOSIS—*Favorable in young subjects, and when disease arises from hypertrophy of bronchial glands—Unfavorable in tubercular, cardiac, or renal cases.*—PATHOLOGY—*Essential cause of asthma consists in a spasmodic contraction of the muscular walls of the bronchial tubes—A true pulmonary neurosis accompanied by catarrh, not necessarily by any fever.*—TREATMENT—*Apartments, and especially sleeping-rooms, to be large and airy—Action of remedies very uncertain—Use of expectorants where there is much secretion and congestion—Nitre-paper fumes—Belladonna—Stramonium—Hydrate of chloral—Ipecacuanha—Strong coffee—Arsenic—Iron—Cod-liver oil—Inhalation of iodide of ethyl and of chloroform to arrest a paroxysm—Injection of pilocarpin—Spray inhalation of carbolic acid, &c.—Galvanism—Care in diet—Avoidance of stimulants—Mild aperients—Gentle exercise—Baths—Sea air—Gymnastics.*

ASTHMA is one of the most peculiar and intractable of diseases, consisting of a paroxysmal form of dyspnœa, with tranquil respiration in the intervals of the seizures. It does not necessarily depend upon organic or structural change in any part of the thoracic organs, and hence it has been looked upon as a purely nervous affection; although it would appear that the integrity of the pulmonary tissue does become impaired and the heart diseased when the paroxysms are frequent, and the complaint is of long continuance.

Neither Underwood, Meigs and Pepper, Steiner, Churchill nor Niemeyer, alludes to asthma in childhood, yet it occurs sufficiently often to require consideration and careful study. Trousseau, Hyde Salter, Thorowgood, West and Berkart, enter into the subject of asthma in children.

Causes.—These are predisposing and exciting. The disease is hereditary, running through families with as much regularity as tubercle, or gout itself. It occurs in the children of parents who are hysterical, or whose nervous system is highly impressible. To a child so predisposed any exertion or emotion will be enough to invite a paroxysm, solely through the effect it produces upon the nervous system, notwithstanding that the lungs themselves are perfectly sound.

Asthma sometimes follows the straining efforts of whooping-cough, repeated attacks of bronchitis, and especially the bronchitis accompanying measles. The inference to be derived from this fact is, that the lungs in such cases have sustained damage which disposes them to asthma. The bronchial mucous membrane undergoes some inappreciable pathological change, and its sensibility becomes morbidly increased. These diseases are, according to Dr Hyde Salter, the commonest of all the causes of asthma; as much as 80 per. cent. of cases of asthma in the young date from one or other of them.* Dr Fuller says that instances are not wanting of its existence in infancy and early youth, and that one of the most frightful examples of it he ever met with was in a boy, thirteen years of age.†

Dr Thorowgood relates the case of a child, aged four, who got an attack of asthma after scarlet fever, though there was no anasarca, the urine only contained lithates, and no albumen. At nine he was still under treatment, and more relief was obtained from a dry bracing air than from any medicine.

Eczema is often associated with asthma.. In 1872 I had a boy, eight years of age, under my care who came of gouty parents. He suffered from extensive eczema of the face and body, and from mild attacks of bronchial asthma, which appeared to follow bronchitis and whooping-cough. Under careful treatment for about a year he recovered completely and is now strong and well. M. Blache and Dr West have noticed the connection between eczema and asthma.* The latter has never known eczema to be extensive and long continued without a liability to asthma being associated with it. Mr Gaskoin says that a connection existed between psoriasis and asthma in at least one third of the cases.†

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* 'On Asthma,' 1860, p. 130.

† 'Diseases of the Lungs,' 1867, p. 368.

The *exciting* causes of asthma are numerous, and they vary in different persons—that which will excite the paroxysm in one person will not do so in another. Irritant substances, such as dust, offensive smells, and cold air admitted into the air-passages in respiration, are common excitants; they appear to irritate the bronchial mucous membrane, and thus to excite convulsive cough and dyspnœa. Trousseau, who himself was a sufferer from asthma, attributes the worst attack he ever had to the dust from oats, which were being measured in his presence, penetrating into the bronchi. He relates cases caused by the thrashing of rice, the shaking of a feather bed in the presence of an asthmatic patient, the odour of ipecacuanha, linseed, or scammony, scents of any kinds, the perfume of violets, and some other flowers. Season, climate, and temperature have also a powerful influence in the production of asthma. The smell of cats, dogs, and hare-skins, seem to be capable of causing the paroxysm in some persons. Trousseau relates the circumstance of two brothers who were twins, and of remarkable physical likeness. When one had an attack of ophthalmia in Paris, the other, who was in Vienna at the time, was also suffering in precisely the same manner. Both were subject to fearful asthma in Marseilles, where they were born; but in Paris they were free. When one was affected the other was also, and both experienced immunity in the same localities.‡

Irritation of the air tubes by the inhalation of dust may cause a certain degree of thickening and contraction of the bronchial tubes, but it is not of itself enough to provoke the asthmatic paroxysm. We know that this is so in mining and manufacturing districts, where workmen are exposed to such inhalation during the chief portion of their lives. The tendency is, however, in them to effect an alteration in the mucous membrane (mechanical bronchitis) and the structure of the lungs, and not to produce spasmodic narrowing, and the resultant asthma. Certain indigestible articles of diet, as cheese and nuts, may, by irritating the pneumogastric nerve in the stomach, excite reflex spasm in the bronchial tubes. In a large number of cases the attack comes on without apparent cause.

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* 'Diseases of Children,' 1884, p. 360.

† "The Relations of Asthma to Skin Diseases," 'Med.-Chir. Trans.,' 1874.

‡ 'Clin. Med.,' vol. i, 1867, p. 630.

The influence which the stomach exercises in provoking an attack of asthma is very remarkable; but it is no more than we might expect when we consider that there is a close connection between the lung and the stomach through the medium of the pneumogastric. In asthmatic cases, the stomach is generally irritable and the appetite irregular. Salter relates the case of a little girl, eight years of age, who vomited everything immediately it was swallowed, but without pain or tenderness. This continued for years, and caused great weakness and emaciation. Nothing, except teaspoonfuls of milk, could be retained on the stomach. At length the vomiting ceased, and asthma began. The irritation was transferred from the gastric portion of the pneumogastric to the pulmonary portion.* Eating late in the day will sometimes provoke a paroxysm, whilst an early dinner, and taking no solid food till next day, will ward it off.

Symptoms.—The child, as is the case with an adult, may seem to retire to bed in good health, and an attack may come on in the night, which is the most usual time. In some cases, however, the attacks would seem to be *diurnal* instead of *nocturnal* (Trousseau). The patient drops off to sleep, and after an uncertain interval wakes up frightened with an attack of dyspnœa, and inability to get his breath. Pain or a sense of constriction, is felt across the chest. He feels suffocated, and is anxious to get all the air he can obtain; hence he may run to an open window, or he at least sits up in bed with his arms thrown backwards, or he kneels, or is propped up in a chair, with his thorax and clavicles fixed, and drawn upwards. The face is flushed, or of a pale livid hue, and fearfully anxious; the skin is bathed in sweat, the eyes are staring and prominent, and the extremities cold. The pulse may be rapid, and the respirations 60 to 70 per minute. The chest is elevated, rounded, and resonant, with scarcely any expansible movement; the epigastrium is retracted from elevation of the diaphragm, whilst the lower ribs are retracted during inspiration. The expiration is prolonged and wheezing, the inspiration is short, frequent, and sometimes convulsive. Sonorous and sibilant rhonchi usurp the place of the normal respiratory murmur.

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* Op. cit., p. 218

The fit may last half an hour in mild cases, or two or three hours in severe ones. Then it passes off, the face assumes a natural appearance, and the child is himself again. During the fit the urine is copious and clear, but when it has terminated it is scanty and turbid. Sleep generally follows a seizure. A sense of heaviness, weight at the chest, and dyspeptic symptoms succeed, to be followed night after night by similar attacks. The frequency of return is uncertain, the interval may be weeks or months; in exceptional cases years may elapse.

The disease often begins with catarrh, constant sneezing, running of the eyes and nose; and these symptoms may have preceded the paroxysm by some days. This is frequently so with children. In these cases there is urgent dyspnœa and inability to lie down; the normal respiratory murmur is replaced by sonorous and mucous rhonchi, which gradually cease after the paroxysm is over.

Trousseau describes a case of an opposite character in a child. "The patient was a Moldavian boy, aged 5, who had very distinct and well characterised fits of asthma, together with some pulmonary emphysema. In his family history there was no mention of any hereditary taint of gout or of rheumatism. I saw him again two years afterwards; he had then a most characteristic fit of the gout, with redness, swelling, and pain in the big toe. This was the first, and has been the last instance I have ever seen of gout at such an early age. The gouty arthritis attacked the knees, and had not the slightest resemblance to acute articular rheumatism. During this attack of gout the boy had not a single paroxysm of asthma. The disease ran its usual course, for, as I will tell you by-and-bye, gout and asthma are often manifestations of one and the same diathesis, and they may alternate in the same individual, as they did in my Moldavian patient."*

Asthmatic seizures have owed their origin to albuminuria and pulmonary œdema, accompanying some forms of Bright's disease.†

Diagnosis.—When there are inflammatory symptoms present in the bronchial tubes, and a great deal of secretion is poured out, the real cause of the dyspnœa may be overlooked; but it will be generally found, on careful examination, that the fever is slight, and bears no comparison to the local trouble; the paroxysms recur at uncertain intervals, and they often terminate very rapidly. The respiration is calm and undisturbed between the paroxysms. The dyspnœa of asthma begins gradually, reaches its acme, and then declines; the dyspnœa of heart disease is generally sudden and due to exertion; it is alarming, and when it has subsided, the patient is not so well as a person after an asthmatic attack, who will be able to go about his duties as though nothing had happened. A patient suffering from heart disease cannot do this. An adult with a delicate heart, or a child with mitral disease, cannot run upstairs or walk up a hill without becoming breathless; but it is not so with the asthmatic, for when the paroxysm is off, his respiration is then free enough. It is important to bear these distinctions in mind, because heart disease is common enough in children. If asthma or heart disease be complicated with emphysema, the diagnosis may be more difficult. A certain degree of emphysema probably complicates all asthma of long standing; although it has nothing to do really with the cause of the disorder, being rather an effect of it.

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* Op. cit., p. 621.

† Berkart, 'On Asthma,' 1878, p. 83.

Dyspnœa of an intermittent character, it should be remembered, is also associated with cerebral disease, but the history would point to its right cause. The irritation of dentition is capable of causing some asthmatic fits. In cases of enlarged bronchial glands pressing upon the vagus and mediastinal nerves, attacks of dyspnœa and difficult breathing not unlike spasmodic asthma, may arise, but these cases ought not to be confounded with genuine spasmodic or bronchial asthma, which solely affects the structure concerned in the paroxysm. An asthmatic paroxysm arising from this cause would be likely to cease as the child grew older and recovered strength.*

Prognosis.—This is greatly determined by the age and constitution of the patient. Dr Hyde Salter states that the tendency in young subjects is almost invariably towards recovery; and that under the age of fifteen, if there is no organic disease, we may generally predict a favorable issue. This arises in a great measure from the power possessed by young persons to throw off disease; and that in the intervals of the seizures the bronchial congestion completely passes off, and the capillaries again recover their lost tone. Then, too, the disease does not last so long as is generally the rule in adults, and moreover the nervous irritability in children, which diminishes as they grow older, also favorably influences the prognosis.* If it is found that residence in some favoured locality keeps off the attacks, while only errors in diet bring them on, then the patients have the cure in their own hands. But if there is heart disease or emphysema, and the asthmatic seizures have recurred so frequently as to induce chronic bronchitis and impeded breathing, then the complication is serious. A recent writer is less hopeful of a favorable termination. He says, "A complete recovery is possible only in children in whom the disease is produced by a simple hypertrophy of the bronchial glands, as this enlargement occasionally subsides and the irritability of the lymphatic system also diminishes towards puberty. But this favorable issue is very rare, and there are few instances in which children have been known to 'grow out' of their complaint."†

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* See Chap. XXXII, "On Enlarged Bronchial and Mediastinal Glands."

The presence of tubercular or renal disease will increase the gravity of the prognosis. In these cases the dyspnœa is permanent. It may be here mentioned, however, that the coexistence of spasmodic asthma and consumption is very rare, so rare that some authorities have denied it altogether. Dr Fuller mentions three cases, and I have seen one. Asthma does not predispose to consumption, nor consumption to spasmodic asthma.‡

It is extremely rare for the disease to terminate fatally in a paroxysm. Hyde Salter never witnessed a paroxysm prove fatal.§ It most usually wears out the patient by causing obstruction to the circulation, and inducing organic disease of the heart and lungs.

Pathology.—The essential cause of asthma is a spasmodic contraction of the muscular walls of the bronchial tubes; and hence the inspiration becomes difficult because enough air cannot be drawn into the pulmonary tissue to properly aerate the blood, the forced muscles of inspiration, such as the scapular and pectoral, are therefore brought into play, and the diaphragm is more or less on a plane. Most competent observers now admit the existence of circular muscular fibres in the smallest bronchial tubes, and they have also clearly shown that irritation of the par vagum will excite contraction of these bronchial muscles.

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* 'On Asthma,' 1860, p. 274.

† Berkart, Op. cit., p. 204.

‡ Op. cit., p. 370.

§ Op. cit., p. 135.

A pulmonary neurosis may be accompanied by moist rhonchi in the lungs—an excess of secretion which is apt to lead the practitioner to suppose that there is inflammation, when in fact there is none. This condition is frequently overlooked in nervous and delicate children; in the rickety it is by no means uncommon to get bronchial sounds of a persistent character following slight catarrh. The secretion from the mucous membrane is considerable, and there is wheezing and hurried respiration, and yet there is no elevation of temperature in asthma. It is not an inflammatory, but a truly neurosal disorder; and if we are not enlightened enough to recognise this, and allow the idea of inflammation in all instances to take possession of us, we shall not relieve the morbid state. If a child who is subject to asthma takes cold, and gets an attack of bronchitis, the bronchial inflammation may act as an exciting cause in producing the asthmatic paroxysm, but it has no power to develop it. The spasmodic character of the complaint is very strongly shown by the relief which the inhalation of sedatives often affords.

The degree of bronchitis alone would not produce the peculiar fit of asthma, which really owes its origin to the spasmodic element. The spasmodic attack is chiefly due to the contraction of the muscular coat of the bronchial tubes. Still, it must be conceded that repeated asthmatic seizures have the effect of thickening, and at the same time permanently narrowing the bronchial tubes, by throwing upon them an extra amount of work to discharge. Hypertrophy takes place in virtue of the same law which causes muscles to become larger when their functions are increased.

Some degree of emphysema is always associated with asthma.

Treatment.—The rooms in which these patients live and sleep should be large and airy, with high ceilings and scanty furniture. If there is not a free supply of air they seem choked, and cannot get their breath. Air is what they want, and they are often driven to the open window to obtain it, unlike patients suffering from any other pulmonary complaint. During the night it is most important that they should have a plentiful supply of pure air.

The next point to attend to is the removal of the neurosal or spasmodic element; the presence of wheezing and catarrhal sounds must not induce us to overlook this important matter, for if we do, and the asthma goes on undetected, we shall not easily subdue the disease. It must be confessed that the remedies are both numerous and uncertain in their effects, one remedy answering in one case and failing to afford relief in another.

If there is much secretion and congestion attending the asthmatic paroxysm, then expectorants will be needed; but if there be pure spasm then a residence either in a moist or a pure clear air must be sought. There are, however, many asthmatics who can breathe well in the close confined air of London, but cannot sleep a night out of it. These peculiarities are most difficult to explain. When the system is low and the vessels are relaxed and weak, it is necessary to select a mild climate, so that the bronchial mucous membrane may not be irritated, and the general health improved.

Nitrous fumes are highly useful in the treatment of asthma when the spasmodic element prevails, and there is no bronchitis present. The fumes act as an antispasmodic and sedative to the irritated bronchial nerves. "The well-known nitre paper is best made by dissolving four ounces of nitrate of potash in a pint of hot water, and in this should be soaked a porous paper of the thickness and consistence of ordinary blotting paper. The paper thus made will be strong, fiercely-burning paper, and should be kept in a stoppered bottle. When used it must be burnt fast and furiously, so as to fill the room, and commonly it is not till the atmosphere is quite thick with nitrous vapours that the asthmatic gets relief."*

If the nitre paper fail, Dr Thorowgood recommends that the powdered leaves of stramonium or dry belladonna leaves be sprinkled on it.† Trousseau advises the burning of stramonium leaves. He relates the case of a child who was always relieved by this method of treatment. The advantage which stramonium smoking has over opium is, that it is a sedative, but not a narcotic. Still, in some cases it utterly fails.

Belladonna is another remedy which sometimes acts in a marvellous manner. It has a similar action to stramonium in diminishing the contractility of the bronchial muscle, and in allaying spasmodic cough. Children, as I have elsewhere stated, bear belladonna well, and therefore the dose must be gradually increased before we give it up as hopeless.‡ The remedy may be sometimes advantageously combined with bromide of potassium.

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* 'Lettsomian Lectures,' "On Bronchial Asthma," 1879.

† Op. cit., p. 65

‡ See Chap. XXXI, "On Whooping-cough," p. 344.

Ipecacuanha, in emetic doses, sometimes brings unexpected and immediate relief; it lessens nervous irritability by its action as a depressant; it relaxes the bronchial spasm, and if there be much catarrh clears the larger bronchi of secretion, and in this way proves beneficial. Dr Salter relates the case of a youth who had asthma from infancy. The attacks would wake him about four or five in the morning. They were attended with severe dyspnœa and wheezing and he was obliged to get out of bed. In half an hour after taking the emetic every trace of asthma had disappeared, and he would then sleep like an infant, and have no return for a week. The dose was twenty grains, and it never failed.[*] Its action was that of a depressant; it produced faintness and nausea, and then the spasm gave way and relief came, before it acted as an emetic. By giving the remedy at the commencement of the seizure we may often cut it short, whereas if the malady is allowed to proceed, and the spasm and bronchial congestion have become thoroughly established, the symptoms are longer in yielding, and when they do there is so much pulmonary congestion and dyspnœa that the consequences of the attack are long and tedious.

Antimony and *tobacco* act in a similar manner, but both have a tendency to produce more collapse.

Hydrate of Chloral, by its power to allay spasm, may shorten the asthmatic paroxysm, and quiet the respiration. It is sometimes given with the effect of relieving the wheezing and sonorous rhonchi.

Coffee is highly recommended by Hyde Salter. He says it relieves asthma in two thirds of the cases in which it is tried. It should be given strong, in small quantities, without milk, and on an empty stomach.[†] Thorowgood gives instances of great success following the use of citrate of caffeine, in doses varying from one to four grains. It appears to calm the irritation of the nerve centres, to allay excitement, and to promote sleep.[‡]

Arsenic has been found very serviceable in spasmodic asthma. It is a remedy which appears to improve the breathing, to increase appetite and digestion, and to act as a general tonic. Where the disease is complicated with eczema or psoriasis, the remedy is very serviceable. The liquor arsenicalis may be given in two-minim doses three times a day after food. It always agrees with children.

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[*] However young the patient, the dose should never be smaller (Salter). The powder is the most desirable form.

[†] Op. cit., p. 182.

[‡] Ibid., p. 72.

Thorowgood speaks well of arsenical preparations in spasmodic and congestive asthma. He recommends gr. $\frac{1}{30}$ of arsenious acid, or liquor arsenicalis ♏ij—♏v three times a day after food.*

Tincture of nux vomica alone, or with the tincture of iron, is also useful in some cases. (Form. 53.) The syrup of the hypophosphite of lime and iron is a good remedy. Cod-liver oil, by improving general nutrition, ought to be given in suitable cases, especially if the patient be strumous or rickety.

The inhalation of the iodide of ethyl, in ten-minim doses three times a day, has been found serviceable in some cases of bronchial asthma, but in other instances it causes vertigo and dizziness. It is antispasmodic, and relieves congestion at the same time.

The inhalation of chloroform has also been employed with great success in arresting a paroxysm. Where the bronchial spasm is severe, and the agony is distressing, there can be no objection to it, if other remedies fail. The inhalation should be proceeded with slowly and cautiously, for it is to be noted that the spasm may yield entirely without insensibility being produced. Temporary relief may also be sometimes obtained by the judicious use of morphia, ether, lobelia, or ammonia.

When the agony is very great, and one remedy after another fails, the hypodermic injection of morphia should be tried.†

According to Salter, opium never does good in asthma. It frequently does harm by narcotising and producing sleep; for the heavier and more drowsy the patient becomes, the more likely is the asthmatic paroxysm to supervene.

Dr Berkhart speaks highly of the use of pilocarpin in the asthmatic paroxysm. He says that it attracts to the skin and salivary glands a large volume of blood, and so relieves the congested internal organs by the copious perspiration and salivation which it induces. Where the cardiac muscles are weak, or the heart is in a state of fatty degeneration, alarming symptoms may ensue, but the subcutaneous injection of gr. $\frac{1}{120}$ or gr. $\frac{1}{80}$ of atropine soon restores the balance. Ten drops of a two-per cent. solution of pilocarpin should be injected for an adult, and a less quantity for a child. The patient should assume a recumbent posture (which the speedy relief afforded enables him to do), and the effects of the remedy watched till they have passed away. Pilocarpin is said to be more suitable in the treatment of the younger asthmatics.

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* Op. cit., p. 69.

† 'Medical Times and Gazette,' Sept. 23, 1882, p. 382.

Spray inhalations of carbolic acid, ipecacuanha, benzoin, creasote, &c., are all useful in certain cases; but in children they are not very easy of application.

Idiopathic asthma has been completely cured by galvanising the neck when various climates and one remedy after another have failed to be of any permanent good. Dr Eade, of Norwich,* and Dr Burney Yeo† have recorded successful cases. The galvanic current is applied to the neck in the situation of the pneumogastric and sympathetic nerve trunk, each pole being placed in front of the sterno-cleido mastoideus, below the angle of the jaw. Dr Yeo, in his paper, refers to a case he saw successfully treated by Dr Shmitz, of Neuenahr, in the manner suggested by Dr Max Schaeffer, of Bremen.‡ The current was mild at first, then gradually increased in intensity till it was felt passing through the soft palate from one side of the throat to the other. It was continued for fifteen minutes twice a day, for six days, and at the end of this time the patient was quite well of the complaint which had lasted six years. The induced current must be employed, and not the constant current, which does no good. Looking at the pathology of asthma as due to a neurosis, the treatment may be resorted to in children with the same probability of success as in adults.

Diet is of the utmost importance. It should be of the simplest description, as roast or boiled fresh meat, chicken, light pudding, &c., given at regular intervals. If the food be indigestible, or too much be taken at one time, then it is apt to disorder the stomach, and to bring on a paroxysm of dyspnœa. It is, therefore, important to select such a diet for the child, that whilst it appeases its appetite it shall contain the necessary nutritious elements. If during digestion the food undergoes fermentation, and produces distension and fulness, the breathing will be deranged.

A sparing quantity of fluid should be taken, and beer and stimulants ought to be avoided. The bowels should be kept free by gentle aperients, as a little sulphate of magnesia, or compound liquorice powder; and if there are worms in the intestinal canal, the proper remedies should be selected for their expulsion.

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* 'Brit. Med. Journ.,' 1883, vol. ii, p. 581.

† "The Treatment of Asthma by the Induced Current," 'The Lancet,' 1880, vol. ii, p. 761.

‡ 'Deutsche Medicinische Wochenschrift,' 1879, No. 32.

Gentle exercise in the open air is most essential when the weather is mild. It brings the muscles into better working order, improves the failing appetite, stimulates the functions of the skin, by which morbid products are removed from the body, and in this way, as the general strength is built up, so the child may possibly grow out of its disorder.

An occasional warm bath at bedtime will prove of great utility, by relieving the congestion of the lungs and bronchi, and in this way will equalise the cutaneous and respiratory functions. Tidman's sea-salt may be added to the morning bath if the child is in a fitting state for it, and the weather is warm enough. These baths act as tonics, and are very useful in strumous and rickety cases.

Dr West recommends a seaside residence for three or four years in a sheltered place with a sandy soil, like Bournemouth, and says that this is often successful in overcoming every disposition to asthma for the rest of the child's life.*

Gymnastic exercises in moderation, and athletic sports, short of fatigue, are very useful.

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* Op. cit., p. 360.

CHAPTER XXXIV

EMPHYSEMA

TWO VARIETIES GENERALLY DESCRIBED—1. *The vesicular.* 2. *The interlobular.*—PATHOLOGY, CAUSES, GENERAL SYMPTOMS, AND PHYSICAL SIGNS.—CONSEQUENCES.—*Case in illustration.*—PROGNOSIS.—TREATMENT—*Iron—Strychnia—Use of emetics and expectorants where bronchitis or asthma are present—Active aperients to relieve congestion of internal organs—Sedatives and sedative inhalations to allay cough—If emaciation or profuse expectoration is present, cod-liver oil or malt extract—Regulation in diet—Gentle exercise—Change of air.*

EMPHYSEMA signifies an excess of air in the lungs, and is either due to dilatation of the air-cells, or to the infiltration of air into the interlobular tissue.

In its acute form it is not infrequent among children. In the chronic form it is rare.

Two varieties are commonly described—1. *The vesicular.* 2. *The interlobular.*

1. *Vesicular* emphysema is the most frequent variety, and may be met with in the youngest infants. A number of air-cells are dilated, and their walls being ruptured and torn they become merged into one, or the alveolar spaces may be simply distended, and their vessels atrophied or destroyed. The lungs are increased in size, and their elasticity is gone, so that when the chest is opened, their anterior borders are in close contact, and they do not collapse. The surface of the lungs is irregularly elevated from dilatation of the air-cells, but there is no escape of air into the connective tissue. A few air-sacs may be involved, the whole of a lobule, or even the entire lung. The apices and margins of the base of the lungs are particularly liable to be affected. The lung-tissue has lost its crepitant feeling to the touch, it pits on pressure, and is doughy, pale, and bloodless; the borders of the lungs come

forwards, covering the heart, and the liver is depressed, whilst the configuration of the thorax is altered, being short, deep, and rounded. The air-sacs become stretched and enlarged, and finally the elastic fibres give way, leading to perforation and rupture. Fatty matter has been found in the emphysematous portions of the lungs, and fatty degeneration assists in the rupture of the air-cells.

2. *Interlobular* emphysema. This variety is comparatively rare in children. The connective tissue which binds the lobules together is infiltrated with air, which escapes into it, and beneath the pleura, in consequence of the air-cells having ruptured. Dr Waters has never seen it as an independent affection, but in almost every case of extensive emphysema the interlobular kind has existed to a greater or less extent. He says it is often very partial and has little disposition to spread.* Dr Walshe, on the other hand, considers that it is very rarely connected with vesicular emphysema.† Cases in which the pleura is raised from the surface of the lung by emphysema are most frequent in whooping-cough. In a case, under my care, the apices of the lungs were much involved, producing a prominent swelling immediately above the clavicles.‡ In this form the air-vesicles are rounded, prominent, and moveable, and can be squeezed from one place to another between the lobules. It may even lead to general emphysema.

Causes.—Emphysema may be produced by mechanical causes, as in whooping-cough and bronchitis, which stretch the air-sacs and diminish their elasticity, without any morbid change in the lung tissue itself. Still the disease sometimes creeps on in children who have not suffered from these affections, or from any violent cough, as we shall hereafter see. There are cases in which it seems to arise spontaneously, such instances being furnished by tubercular and strumous subjects. In some children it appears to be congenital, and in two cases which came under my care in 1876 and 1877, no other cause could be assigned. Of forty-three emphysematous persons the hereditary tendency was well marked in five cases, from seven to twenty years of age, and all were predisposed to the disease in either parent.§ It often arises in connection with pulmonary collapse, and the forcible inspiration, and strain put upon the distended air-vesicles by coughing, are fertile causes. It is not commonly associated with pneumonia, and rarely with tubercle or phthisis; but in nearly every case it may be stated that there is pre-existent disease in some of the vesicles or lobules of the lungs. It is probable that when the disease is partial, and has followed any pulmonary affection in which there has been violent and long-standing cough, the emphysema may be the result of mechanical violence without any previous degeneration in the tissue of the lungs, but in the vesicular form, where both lungs are affected, and the disease has come on insidiously without any history of cough, some form of degeneration is at the root of the evil.

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* 'Diseases of the Chest,' 1873, p. 113.
† 'Diseases of the Lungs,' 1854, p. 489.
‡ See Chap. XXXI, "On Pertussis."
§ Fuller, 'On Diseases of the Lungs,' p. 359.

Symptoms.—These are shortness of breath and dyspnœa, increased by walking fast, ascending a hill, or going upstairs. At first this is only felt on exertion, but as the disease advances the breathing becomes accelerated and even panting when the patient is sitting still. An attack of bronchial irritation, or indigestion, will aggravate the condition, particularly if there is flatulence. In many respects the symptoms, are less urgent in children than in adults, and the fits of orthopnœa and violent palpitation, which are so common in the latter, are not usual among the former in the most advanced stages of the disease. The sputa are bronchial, and sometimes, though rarely, there is a little blood, from the rupture of small blood-vessels in the distended lung tissue. The face is dusky and anxious, and in old-standing cases, it has a cyanotic tint; the nostrils are dilated, the voice is weak, and the cough feeble; the pulse, like the respiration, is usually slow; the hands feel cold, and the fingers have a bluish tint. Headache and drowsiness are common. In some cases emaciation is considerable; the abdomen is large, and as the disease is confirmed the liver and spleen become increased in size. If dropsy occur there is generally tricuspid regurgitation. In recent cases, complicated with whooping-cough, the lips are puffed and venous, the conjunctivæ are watery and injected, and the nose loses its outline from puffiness and infiltration of the subcutaneous cellular tissue.

The complaint is increased in the winter and spring months, and decreases in summer and mild weather. In those cases which are owing to permanent organic change, dry bracing weather always relieves the breathing.

The respiration is characteristic. The child, like the adult, leans forward in bed with its hands folded, the muscles of the neck, as the scaleni and sterno-cleido-mastoidei, being brought into powerful action, and the shoulders rounded. The upper part of the chest is nearly fixed, for the lungs, having already expanded to the utmost, are scarcely affected by inspiration. The lower portion of the thorax is drawn in, and the diaphragm in these cases appears passive, and the abdomen flat, or even concave. The respiration varies, however, the thorax, in some cases, being distinctly raised and elevated, and the abdominal muscles forcibly expanding. The inspiration is short and hurried, from the diminished expansion of the chest, and the expiration is wheezing and prolonged, because the elasticity of the lungs is lessened. In conversation, the child waits to get breath if its answers are required quickly, and spasmodic fits of coughing are common if the bronchial tubes are loaded with mucus. The character of the breathing is one of the most significant symptoms of the complaint.

The amount of crepitation and rhonchus that is heard depends to a great extent upon the bronchitis or asthma that may be present.

Physical signs.—There is bulging of the infra-clavicular, mammary, and entire sternal regions. The thorax is elevated, and its circumference increased at its upper part, not only because the ribs are more horizontal, and the intercostal spaces widened, but the lungs themselves are larger from overdistension of the air-vesicles. The gait is stooping, and the dorsal spine curved forwards. The neck appears thick and shortened, whilst the clavicles are prominent and the supra-clavicular fossæ are deepened. These spaces are sometimes obliterated, or they are prominent and puffy in consequence of the emphysematous apices of the lungs forcing their way upwards from the thoracic cavity. The resonance is sometimes so increased as to amount to tympanites over the whole thorax, the note on percussion being much exaggerated in clearness and fulness, especially along the line of the sternum, where the borders of the lung approximate. This clear percussion sound arises from there being more air within the chest, and inspiration does not, as in healthy lungs, affect it, nor is it diminished by any forced expiratory effort.

When the lungs are much involved the heart is pushed backwards and downwards towards the median line, and the whole cardiac region is resonant, notwithstanding a great amount of hypertrophy of the right heart. Epigastric pulsation is often observable. If the heart is simply thrown backwards behind the overlapping lung the sounds are weaker and more distant. When in long-standing cases the right heart is unable to empty itself, the auriculo-ventricular valve becomes damaged, and being unable any longer to fully contract on its contents, the walls of the ventricle yield, and become dilated, so that congestion of all the internal organs takes place gradually, and this quantity of blood being thrown back on the general circulation, venous congestion is sometimes followed by ascites and anasarca. But this is rare.

In children, where the disease has been of any continuance, there is often marked anæmia and pallor of the surface; they lose flesh and strength, and become sallow and cachectic as the complaint continues, or there is a fixed venous abrupt colour on the cheeks, as we have before remarked. It is in such cases as these that we often notice that the neck is broad, the jugular veins are swollen, and the shoulders elevated.

One of the most marked cases of emphysema I have seen, was that of a girl, æt. 11, who was of short stature and very thickly set; her tibiæ were both curved anteriorly at the lower third, the head was large and the neck very short. Her face had a distressed and sad appearance from cardiac trouble, and the thorax presented the following condition:—It was deep in its antero-posterior diameter, and much rounded, and the intercostal spaces in this situation were completely obliterated. The elevation commenced immediately, and somewhat abruptly, below the clavicles, and was rounded to the nipple on the right side, whence the ribs sank in; on the left side it was much more bulging and prominent over the whole cardiac region, and, in consequence of the hypertrophied and strong action of the heart, the ribs below the nipple were not retracted as on the other side. The upper portion of the lungs, being in a state of emphysema, had forced the heart downwards, as we sometimes see in aortic regurgitation, and had produced collapse in the lower lobes. The apex beat, instead of being limited to the area of health, was diffused over a large space; long-continued congestion had caused enlargement of the liver, so that its edge could be felt in the epigastrium. The breathing was diaphragmatic, the upper part of the sternum almost fixed in respiration, though the clavicles and shoulders rose with each inspiration, slight cup-shaped depressions being noticeable above the clavicles. The whole thorax rose at once, instead of the slow dilatation as in health. The sinking in of the epigastrium, and the drawing inwards of the lower ribs during inspiration, proved that the entrance of air to the whole pulmonary tissue was interfered with, and this sometimes happens in bronchitis, causing collapse of the lungs. Posteriorly the chest was much rounded and the sternum arched, and although the child was not stout, the internal or posterior border of the scapulæ could scarcely be seen.* Dr Steiner says:—"The capacity of the chest is increased, though it does not present the peculiar barrel-shaped enlargement, which is the result of emphysema in adults."† No better instance to the contrary could have been furnished than this case.

There was a difference on percussion, the note was more resonant over the greater part of the right lung, and the breathing weaker, the inspiration being very short and deficient, and the expiration prolonged. Over the left lung, the inspiration was longer, but not so much so as the expiration, which was musical and wheezing, and the lung was less resonant throughout. In the right axilla, and as low as the line of the fourth rib, a little faint breathing was heard, but none over the retracted ribs or the infra-axillary region indicating collapse. The pulse was 96, resp. 32, temp. normal; no expectoration. The face was not swelled, but the cheeks had a deep crimson flush, and the lips were dusky. From time to time, in consequence of the gravity of the heart affection, there was great headache, owing to passive hyperæmia of the brain; the forehead was hot, and ached for days together; the jugular veins were swollen, the temporal vessels were full and throbbing, and the child did not know where to lay her head for ease. The whole cardiac region was resonant, from the edges of the lungs being emphysematous and overlapping the heart. It was somewhat remarkable in this case that there could exist such a degree of heart disease (tricuspid and mitral) with obstruction to the circulation through the lungs without any sign of dropsy, or turbid urine, the latter secretion being at all times free and healthy.‡ Indeed, in children I have rarely met with ascites or anasarca. But we know that emphysema, especially with heart affection, is prone to produce these complications.

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* "Heart Disease in Children, connected with Valvular Disease, and with Thoracic Deformity," 'Medical Society Proceedings,' vol. iv, p. 196, and 'Medical Press and Circular,' May 7—14, 1879.

† 'Diseases of Children,' 1874, p. 157.

‡ In confirmed cases of vesicular emphysema, renal congestion takes place, when albumen and sometimes blood are present in the urine. It is in such cases that the secretion is often high-coloured, and throws down copious urates on standing. At other times in equally severe cases the urine may be abundant and clear, and of low specific gravity. When there is a large and persistent amount of albumen, and the circulation through the lungs is not much impeded, there is suspicion of organic disease of the kidneys.

Prognosis.—Emphysema is irrecoverable when complicated with organic disease of the heart or asthma. In the chronic form the prognosis is always unfavorable. When it occurs as the accompaniment of whooping-cough, it will gradually pass away with the disorder, and the child may grow up without any sign of ever having suffered from it. The pathology of the disease proves that the ruptured lung tissue is incapable of repair, but in slight and recent cases we may do much to arrest further destructive changes.

Treatment.—Constitutional remedies are chiefly to be relied upon in these cases, for if we cannot again restore the elasticity of the walls of the air-cells to their normal state, we may prevent, or at least indefinitely retard degeneration in the structure of the lungs. If there is an absence of renal disease, and the heart is feeble, we must select such remedies as will strengthen it, and improve the quality of the blood at the same time. In the shape of drugs, iron is one of the best remedies for improving the cachexia which is so often present. The tincture of the perchloride is my favourite form. Dr Waters speaks well of the ethereal tincture of the acetate. Strychnia has been employed to increase the tone of the muscular fibre in the relaxed bronchial tubes, but no positive benefit has ever followed its use, nor has electricity done any good to the damaged pulmonary tissue.

If bronchitis is an accompaniment, and the disease is acute, it will demand for the time being our chief consideration, but the remedies should not be too depressing. An emetic of sulphate of zinc is sometimes useful by relieving the pulmonary congestion and overloaded digestive organs, particularly if there is dyspnœa. Where the mucous membrane is dry, and the breathing short, ipecacuanha and the solution of the acetate of ammonia may be employed, with or without iodide of potassium or chloride of ammonium, to favour secretion. If there is difficulty in expectoration, and of ridding the bronchial tubes of mucus, carbonate of ammonia, squill, senega, and wine will be needed. Sometimes the ethereal tincture of lobelia is serviceable, and from ten to fifteen drops may be given, in a little water with syrup of tolu every hour till relief comes. After this stage has passed away iron may again be given.

For the asthma, heart disease, and dropsy accompanying emphysema, the treatment must be directed in accordance with the prevailing symptoms.

Where there is passive hyperæmia of the chief internal organs, as the liver, spleen, and kidneys, a scanty diet and free purgation will be occasionally needed. No remedies tend so effectually to relieve the shortness of breath as a grain of calomel now and then, followed by a seidlitz powder, or some saline aperient. After this a gentle effect on the liver may be kept up by taraxacum, with a few grains of bicarbonate of soda, or the nitro-muriatic acid with taraxacum, or calumba (Form. 20—42). Quinine and small doses of strychnine, to improve appetite and digestion, are to be recommended.

Where the brain is overloaded with blood from passive congestion, a few leeches to the temples and cold to the head, will be required before relief follows.

Sedative remedies to relieve cough, if at all violent, must be given (Form. 65—74—75); they obviate in some degree the congestion of the lungs which is sure to follow continued paroxysms, and prevent the patient from obtaining rest. Sedative inhalations are also useful. The required quantity of chloroform, or nitrite of amyl, conium, or hops, may be put on a piece of sponge and inhaled through a convenient apparatus, as the steam of hot water passes through it, or, the medicated fluid may be put into a pint of water at 150°, and the inhalation be continued for about ten minutes. The patient should inhale before meals, and, should not venture out of doors for some time afterwards. The Eclectic Inhaler, made by Maw, at the suggestion of Dr Morell Mackenzie, is very convenient.*

If the bronchitis and catarrh when present be attended with profuse expectoration, and the child is losing flesh, quinine, iron, the mineral acids, and cod-liver oil or malt extract, will be beneficial.

Blisters are not required for children, but liniments, turpentine fomentations, and mustard poultices, may be needed to relieve congestion of the stomach or lungs.

The diet in all chronic cases must be generous, and carefully regulated, the food being nutritious and given in small quantities, so as not to overload the digestive organs and cause flatulence, which distresses the heart by interfering with the action of the lungs, and the descent of the diaphragm.

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* 'The Pharmacopœia of the Hospital for Diseases of the Throat,' 1872, p. 67.

Gentle and never violent exercise should be resorted to, care being taken to avoid fatigue, and to calm the nervous apprehensions of the sufferer.

Change of air to a mild and equable climate often proves of great benefit, our chief object being to prevent the liability to catarrh.

CHAPTER XXXV

BRONCHITIS

TWO VARIETIES.—1. *The acute.*—2. *The chronic.—Exposure to cold a common exciting cause of the acute—Irritation of dust and noxious vapours—Often an accompaniment of measles and whooping-cough—Bronchitis from tubercular, renal, and heart diseases—Mortality of bronchitis.*—SYMPTOMS OF ACUTE BRONCHITIS—*Character of cough—Temperature—Pulse—Respiration.*—CAPILLARY BRONCHITIS—*Death from exhaustion, convulsions, or coma—Indications of danger—Physical signs—Diagnosis.*—CHRONIC BRONCHITIS—*Symptoms—Collapse of lung—Pathology.*—TREATMENT OF ACUTE BRONCHITIS—*Depletory measures—Tartarated antimony—Diaphoretics—Emetics—Aperients—Henbane—Hydrate of chloral—Bromide of potassium—Local applications.*—TREATMENT OF CHRONIC BRONCHITIS—*Expectorants—Emetics—Quinine—Mineral acids—Cod-liver oil—Inhalations—Change of air—Warm clothing.*

Two varieties of bronchitis are described, the Acute and Chronic. The Acute frequently follows on ordinary catarrh or cold, which for some days has seized upon the young patient with the well-known symptoms previously described—running from the eyes and nostrils, frontal headache, loss of appetite, sore throat, and febrile disturbance. At the end of a few days, the irritation may have extended to the bronchial membrane, and the child gradually getting worse is unable to leave his bed.

Causes.—The chief of these are exposure to cold and sudden changes of temperature, hence its prevalence in the spring and winter months; insufficient clothing, the irritation of dust and noxious vapours. Children are liable to bronchial attacks when suffering from debility, anæmia, or from any circumstances that tend to lower the general health. During dentition bronchitis is of common occurrence. It frequently accompanies measles, scarlet fever, and smallpox. Measles and whooping-cough are the two diseases with which it is most commonly associated. In measles the pulmonary mucous membrane is particularly liable to inflammation, and sometimes it is seriously affected, producing capillary bronchitis and broncho-pneumonia. The disease may arise during an attack of diphtheria, croup, typhoid fever, pneumonia, pleurisy, &c. It occurs in tuberculosis, albuminuria, and some other disordered states of the blood. Bronchitis may also arise from hypertrophy and valvular diseases of the heart in children, which induce local congestion and disturb the balance of the circulation. It is sometimes complicated with laryngismus.

The mortality of bronchitis in young children constitutes it one of the most fatal of diseases.

Symptoms.—The general symptoms of the *acute* form depend on the extent to which the respiratory tract is involved. If the larger bronchial tubes are affected, and the smaller have escaped, the constitutional disturbance is moderate, and the child may be up and have an appetite for food; but if the seizure has been sudden and severe, and the smaller ramifications of the tubes are implicated, there may be considerable dyspnœa and paroxysms of coughing, coated tongue, high-coloured urine, flushed face, elevation of temperature, headache and thirst. If the child is old enough to talk, and to express its feelings intelligibly, it will complain of soreness, and even pain over the sternum, an irritation in the trachea, and a sense of constriction at or about the epigastrium corresponding to the insertion of the diaphragm. The cough is frequent, tight, and tearing, and it persists whether the child is awake or asleep, while it will often raise itself up in bed unconsciously, from the severity of the paroxysm, as if frightened and look about in amazement. The pulse becomes rapid, the temperature is elevated from 99° to 102° or 103°; frequently it is not above 100°, and in many severe cases when the pulmonary condition denotes considerable danger, it is scarcely raised above the normal standard, though the pulse may reach 140, and the respirations be 50 or 60 per minute, with noisy breathing and prolonged expiration. In these cases the nervous excitement is great, and exhaustion is evident, and there is often a good deal of mucus in the tubes, indicated by catarrhal sounds, and loose cough. If the cough is severe there may be streaks of blood in it. When the temperature remains low or falls, and the pulse and respirations are quick, debility is the chief element to contend with, unless there is enough mischief in the lungs to account for the constitutional condition. If the pulse is quick, the respiration is usually quick also, and as the one falls so does the other; but it will often be observed, when there is nothing in the chest to account for it, that the pulse drops in frequency and improves in quality, whilst the respiration remains quick for a considerable time, and only falls to the normal standard as the strength is re-established. In children of a few months old, who have never been strong from birth, there may be loud mucous rattling over the back of the chest, and wheezing at each inspiration; they may vomit all the food they take from the violence of the cough. These symptoms, which increase in severity at night and may be followed by convulsions, are not uncommon in cases of bronchitis complicated with whooping-cough.

The cough of children, as of adults, is much influenced by the position they assume in bed. When they sink low down, with the head bent forward on the thorax, the cough is distressing, and though worn out and weary, they are prevented from sleep by the constant and harassing irritation; it is almost useless to rectify their position and to raise them up in bed, for they quickly sink down again with the head buried in the clothes.

It is important to bear in mind (although every practitioner is acquainted with the fact) that young children do not expectorate, probably few under ten years of age. They swallow the sputa from time to time, or the secretion so accumulates in the larynx and trachea that an emetic is required to dislodge it.

In young children, the secretion into the smaller air-tubes is sometimes so profuse as to give rise to suffocative catarrh and convulsive cough, because the mucus is drawn back and cannot escape. When the tubes are so distended no air can be heard to enter the chest. In these cases there is often a good deal of oppression, tightness, and pain at the chest, dyspnœa and extreme restlessness. The child is flushed in the face; the skin is hot or perspiring, and the veins about the neck are distended from the circulation being impeded through the right heart; the tips of the fingers are livid, and the countenance is dusky. This is known as "*capillary bronchitis.*" In severe cases, clots form in the heart or pulmonary artery, the pulse increases in frequency, or is intermittent and feeble, whilst the temperature falls and the skin is bedewed with a clammy sweat. There is great danger in this condition, and in many cases the next alarming stage is reached. The child becomes more drowsy and unconscious, and there is difficulty in rousing it to take nourishment. It probably coughs less, though the air-tubes are more loaded; the pulse becomes more rapid and feeble, and the respiration is quick, short and silent. In consequence of the circulation being nearly arrested in the lungs and the right cavities of the heart, the child may die at any moment, from suffocation, with convulsions or coma.

We sometimes meet with bronchitis in children of a few months old, who cough and breathe badly for weeks before the acute affection is fully developed. The children have perhaps been brought up by hand, and are feeble and flabby—they breathe badly at night from the accumulation of phlegm; the bowels are relaxed, and the motions white or greenish; the breathing is accelerated, and the expiration is noisy and wheezing; the pulse is quick, but the temperature not much elevated. The cough may be so great that the food is vomited, and there may be wasting in consequence.

The indications of danger are urgent dyspnœa, livid or dusky features, quick pulse, sweating skin, and failure of strength. In capillary bronchitis the danger to life is greater, because the swelling of the tubes interferes with the aëration of the blood; and also because there is a great tendency to collapse of the lung.

Physical signs.—The chest is found to be resonant throughout, and loud rhonchi of a sonorous character are heard over the upper lobes of the lungs posteriorly, especially between the scapulæ; whilst the respiration may be clear in the lower lobes. In children of good constitution, the disease, even when very acute, does not invariably extend beyond the larger bronchi. If the symptoms increase, sibilant rhonchi (sounds less coarse and large, but more shrill than the former), denoting implication of the smaller bronchi, are heard in the inferior lobes.

Rhonchus and sibilus may occur together at the same time, and they generally do, but they may be present independently of each other. The same may be said of the large and small crepitation, the one heard in the large and the other in the small bronchial tubes when there is an excess of fluid in them. Just as sibilus is a more important sound than rhonchus, so is small crepitation than large crepitation, because it denotes the implication of the ramifications of the bronchial tubes.

I have described the course which bronchitis usually takes, but all cases do not run into the moist stage, or that in which crepitation is produced. Now and then the disease stops short of this. Rhonchi and sibili may not proceed further, but be succeeded by the normal respiratory murmur, without any secretion being poured out.

All practitioners have seen cases where rhonchus and bronchial breathing have been the only physical signs heard in the lung. Ringing cough, soreness of the chest, hurried respiration, flushed face, and fever have been the leading symptoms. Three or four days later, the disease has passed away without any secretion taking place. I do not think this is frequent; one or two attacks may end in this way, but subsequent seizures are sure to be followed by copious secretion. In young children, if there is loud rhonchus, it is nearly always succeeded by moist sounds, and the secretion so poured out often causes dyspnœa and death. In 1869, I attended a boy, ten years of age, who had been laid up with cough and febrile symptoms for three days. When I saw him on the fourth day he had become much worse, his breathing was hurried and difficult (40 per minute), nostrils active, face flushed, pulse 100. Loud rhonchus and sibilus with shrill musical sounds were heard throughout the lungs; percussion was clear both in the front and back of the chest, and the heart's sounds were normal. There was no history of asthma, but I suspected a certain amount of spasm in the case. A grain of calomel was given on sugar, and a mixture, containing a few grains of nitrate of potash, and the sixth part of a grain of tartarated antimony, every four hours. A poultice was applied to the chest. Next day he was better, and three days later he was well, without any secretion into the air passages having taken place. A very similar case is described by Dr Latham.*

When the inflammation is severe, the elasticity of the lungs is greatly impaired, and the lobules becoming distended and weakened, the air is imprisoned and cannot escape. When this takes place the vesicular murmur is abolished, and there is urgent dyspnœa, and wheezing sounds are heard throughout the chest. The character of the crepitation varies according to the size of the implicated tubes. When the secretion is fairly established, coarse, loose, and moist crepitation are heard over the larger tubes, and small crepitation over the smaller ones; indeed, the sounds are so varied and peculiar in some cases as to be whistling and musical, resembling the rush of air and liquid through a narrow contracted tube.

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* 'Clin. Med.,' vol. ii, New Syd. Soc., 1879, p. 118.

Diagnosis.—In severe cases, it is extremely difficult to distinguish the line which separates inflammation of the finer bronchial tubes from that of the vesicular structure. The real distinguishing mark is the absence of dulness, in the first case, and its invariable presence in the latter. The cough in pneumonia is much more tearing and painful, the child seems to dread it, the dyspnœa is more urgent, and the temperature is higher.

Chronic bronchitis is a sequel of the *acute* form, or it may result from neglected colds and repeated attacks of bronchial catarrh. If the general health has been reduced, or the child is delicate and of tender age, it is a very obstinate complaint. Strumous and rickety children are especially liable to this form of bronchitis. When it persists in mild weather and in spite of careful management, it should put us on the look out for tubercle. In the cold weather of spring and winter, young children are liable to subacute attacks of bronchitis, with feverishness, wheezing and troublesome cough. If dentition is going on at the same time, the appearance of each new tooth is a signal for fresh pulmonary irritation, because the general health is lowered and the child is too weak to resist the changes of weather. Not uncommonly it will be found associated with emphysema, renal change, and with valvular diseases of the heart, which interfere with the pulmonary circulation and induce congestion of the bronchial ramifications.

Symptoms.—There is often loose cough, followed by the vomiting of yellowish, frothy expectoration, coming on in paroxysms; in some cases where there is loss of flesh the expectoration is purulent. Percussion is often clear over the sternum, especially so between the scapulæ, and the respiration is bronchial; subcrepitant rhonchi may be heard over the front and back of the chest. It is the exception to meet with any rise of temperature, but when it does so towards evening, and falls in the morning, it is suggestive of organic mischief.

Collapse of the lung is one of the consequences of bronchitis, and it has been asserted by some that it may either lead to pneumonia, or to a more serious condition. The collapsed portions of the lung require to be distinguished from pneumonic consolidation; they are not really pneumonic, for although of a venous red or plum colour, and not crepitating under the finger, they are wanting in firmness. They bear no traces of inflammatory exudation and sink when placed in water. Moreover, they can be inflated. When the secretion from the bronchial tubes becomes copious and organised, a plug of mucus is apt to be carried along one of their ramifications till it is arrested, so that it cannot pass in any direction. In expiration, the air behind the obstruction dislodges it to some extent, and passes outwards, but the act of inspiration draws it back again into the tube, where it becomes wedged, and does not permit any air to enter the collapsed lung.

Pathology.—In health the mucous membrane of the bronchi and their smaller ramifications is smooth and uniform, and pours out just enough mucus to keep them moist and lubricated, and to prevent dryness. When, from congestion and hyperæmia of the membrane, an abnormal quantity of mucus is secreted, it accumulates in the bronchi and dyspnœa is the result. The larger bronchi may be alone affected, and the smaller escape, or both may be involved when the disease is much more serious; but it is seldom that all are alike affected, and one lung may be much more involved than the other. The inflamed mucous membrane is of a pinkish hue, the vessels are injected, and arborescent, and if the attack goes on, the mucous membrane becomes darker, of a dusky scarlet tint, thickened, and of a soft velvety appearance, being covered with mucus. Dr West relates the case of a little boy, twenty months old, who died rather suddenly from bronchitis, and after death, besides a general redness of the bronchial tubes, there were several small excavated ulcerations or erosions in the upper part of the larynx, just above the chordæ vocales.* In the bronchitis of measles, the mucous membrane is covered with spots, similar to those on the skin, and in smallpox, pustules have been met with in the trachea and larger tubes. The blood-vessels are overloaded, and with increased exudation from the serum of the blood there is an œdematous state of the tissues, and the mucus presents an increased number of epithelial cells. The secretion is at first thin and frothy, with a good deal of air; then it becomes tenacious and glairy, and mixed with purulent secretion.

Very small abscesses, the size of a hemp-seed, have been described by Dr Gairdner, and termed by him "bronchial abscesses." They are found in the centre of a collapsed lobule at the termination of the smallest bronchial tubes. These tiny abscesses have been mistaken for tubercular. He mentions a case of fatal pneumothorax in a girl, eight years of age, who died of typhoid fever, and after death "very minute bronchial abscesses" were found in the lungs, which were perfectly free from tubercle.*

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* Op. cit., 1859, p. 295.

In *chronic bronchitis* the mucous membrane approaches a livid tint, and is swollen in some cases, whilst in others scarcely any change is noticeable, and the inflammation does not extend to the submucous tissue. In other cases there is hypertrophy or degeneration of the muscular fibres and considerable dilatation of the smaller bronchial tubes. Emphysema and pulmonary collapse are also sometimes associated with this form of bronchitis.

Treatment.—In the acute variety, the first step to insist upon is to put the child to bed, and then to direct our treatment according to the age and severity of the attack. The temperature of the room in acute bronchitis should be maintained at not less than 70°, and in cold weather a bronchitis kettle should be used to moisten the atmosphere. If the larger tubes of the lungs are implicated, and there is heat of skin and febrile disturbance, a warm bath, and a saline diaphoretic mixture will be advisable, and this, by inducing a free action of the skin and kidneys, may cut short the attack. When the symptoms are of a more serious character, more active treatment will be required. Venesection is not to be thought of, and leeching is rarely required. I have never found it necessary to employ either in the case of a child, but when the respiration is greatly accelerated, and there is so much rhonchus as to indicate great congestion of the vessels, two or three leeches might prove serviceable. In children the constitution is usually not robust enough to stand the loss of blood, and it must not be reckoned among the appropriate remedies. Small doses of tartar emetic (Form. 7) will generally suffice, and if they should excite vomiting at first, it will be no drawback. The one sixth or one eighth of a grain in solution with the liq. amm. acet. every three or four hours favours secretion, and lessens the severity of the symptoms. It is important to change the hot dry skin into a moist and relaxed one; and the same applies to the congested mucous membrane of the bronchi. Even in these cases it is necessary to be watchful and cautious, as depression and exhaustion may quickly ensue. When antimony is employed, strong children only should be selected, for a few doses will generally produce a rapid and lowering effect, and they cannot be too carefully watched. Pallor of the face, duskiness of lips, sweating skin, and increased bronchial râles are to be looked for, and the local as well as the constitutional condition will grow worse instead of improving in young subjects, unless they are vigorous. The vinum antimoniale is generally sufficient to control ordinary cases. In infants and very young children ipecacuanha is preferable, and even this milder remedy should be watched, and combined with the spt. æther. nitr. or the liq. amm. acet. I have sometimes given hydrocyanic acid in addition to arrest vomiting.[*] If the child becomes pale after a few doses, and the skin is moist and the pulse weak; or if the temperature is falling, it should be discontinued, and ammonia, nourishment, and even wine or brandy employed. In very young children, when the face is dusky, and there is drowsiness, with loose coarse râles over the chest, there is no better combination than the carbonate of ammonia and spirit of chloroform.[†] Even in these cases I have sometimes known an emetic of ipecacuanha and sulphate of zinc have a remarkable rallying effect by dislodging a large quantity of bronchial mucus.[‡] A few drops of brandy should be given in milk frequently, or a small quantity of champagne in soda water; water arrowroot, to which brandy is also added, and beef tea, veal, or chicken broth will be demanded. Under this treatment the temperature may fall from 102·4° to 100°, and the pulse from 160 to 140 in the course of a few hours. In the case of strong children, with much febrile excitement and sthenic action, it may be well to give a powder of calomel, James's powder, and nitrate of potash[§] (Form. 62). I find this an excellent combination to act on the skin and bowels, exciting free action in these organs and so reducing the fever, and controlling the constitutional disturbance. Four of these powders are enough in my experience to bring about the desired result, and it must be understood that the administration of a remedy like calomel is only called for under the conditions above enumerated. When the disease is limited to the larger bronchi, and there is great hyperæmia of the vessels, it has an extraordinary effect upon the capillary circulation. Whilst it encourages secretion, it subdues the tendency to inflammatory action, and the plastic effusion which frequently follows it. When the cough is very troublesome, a mixture of syrup of squill and syrup of tolu will be useful,[*] and if the bowels are sluggish, syrup of senna or rhubarb may be added.[†] An occasional soap-and-water enema is useful to excite peristaltic action. In some mild cases the citrate or bicarbonate of potash, with ipecacuanha, will be found a suitable remedy, if the tongue be coated, and an alkali is indicated.[‡]

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* 'Clinical Medicine,' 1862, p. 406.

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[*] Form. 60:
℞ Liquor. Amm. Acet. ℥j
Acid. Hydrocy. Dil. ♏viij
Vin. Antimonalis ♏xl
Syr. Scillæ ʒss
Aquam ad ℥iv.
M. A dessert-spoonful every four hours.
For a child five or six years old.

[†] Form. 61:
℞ Amm. Carb. gr. iv
Spt. Chloroform. ♏xx
Syr. Tolut. ʒss.
Aquam ad ℥ij.
M. A teaspoonful every four hours.
For a child a year old.

[‡] See the action of emetics in the treatment of broncho-pneumonia, Chap. XXXVII, and in Chap. II.

[§] Form. 62:
℞ Hyd. Chlorid. gr. ij
Pulv. Antimonialis gr. viij
Potass. Nitrat.
Sacchari āā gr. xij
M. Et divide in pulveres iv.
One every four or six hours.
For a child five years old.

When there is much restlessness henbane will be required, or even hydrate of chloral, if there is vascular excitement; but this last-named fashionable drug, like opium, should be used with caution.[§] Chloral requires great care in its employment, as it may depress the respiratory centres and the nervous ganglia of the heart. When the nervous element prevails, as it does in some children, a sedative is useful to procure rest and sleep, and for this end, a few grains of the bromide of potassium, with or without chloral, or even Dover's powder alone, will be serviceable.

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[*] Form. 63:
℞ Syr. Tolut.
— Scillæ
Aquam āā ℥ss.
} M. A teaspoonful when the cough is troublesome.

[†] Form. 64:
℞ Syr. Tolut.
— Scillæ
— Sennæ āā ℥ss.
} M. A teaspoonful twice or three times a day, or when the cough is troublesome.

[‡] Form. 65:
℞ Potass. Citrat.
vel — Bicarb. ʒss
T. Camph. Comp.
Vin. Ipecac. āā ʒj
Syr. Scillæ ℥ss
Aquam ad ℥ij.
} M. A teaspoonful every three hours.
For children from one to two years of age.

[§] The physiological and therapeutical action of hydrate of chloral are considered in Chap. XXXVII, "On Pneumonia."

When secretion is freely established, such expectorants as ipecacuanha, squill, and senega will be necessary.*

As regards local applications, a large warm poultice, made with equal parts of linseed meal and bread, should be applied to the chest. In some cases the addition of a little mustard (one in six) is advisable, or a piece of spongio-piline wrung out of hot water and sprinkled with a few drops of a liniment of chloroform and camphor answers well, but great care must be taken not to excoriate the tender skin of a young child. Whatever application is used, must be changed frequently, and continued till the dry sounds are replaced by moist ones, and secretion is freely established. In very young children it is an excellent plan to envelope the chest (front and back) in cotton wool, and to cover this with oil silk. This acts like a mild poultice and is much less distressing to the little patient.

I have observed immense relief in many cases from placing young children as much as possible on the abdomen; but this can only be done with infants satisfactorily. It relieves the cough and respiration, and the tendency of the secretion to gravitate to the lower and posterior surface of the lungs is lessened. The child should be held across the arm of the nurse, with its face downwards, and kept for some time in this position. In the winter of 1876, I attended a child seven months old with acute bronchitis, and I am satisfied that recovery was in a great measure due to the position the child was kept in during the catarrhal stage, when the secretion was copious and the cough exhausting. The child was weak, and at one time unable to cough from the loaded state of the tubes, and the weakness of the respiratory act. There was danger of the elasticity of the lung being destroyed by the accumulation of phlegm in the dependent parts of the chest. I therefore had the child turned on its face, and laid across the nurse's lap in a semi-erect posture. It soon began to improve, coughing up phlegm easily, and sleeping soundly at intervals. An emetic of ipecacuanha in these cases at bedtime is sometimes advisable, and even at an early stage it may subdue the hyperæmia of the tubes, and shorten the severity of the acute stage.

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* Form. 66:
℞ Vin. Ipecac.
Tinct. Scillæ āā ♏xl
— Conii ʒj
Spt. Æther. Nit. ʒj
Syr. Tolut. ℥ss
Decoct. Senegæ ad ℥iv.
M. A dessert-spoonful every four hours.

The duration of the disease is uncertain. It may destroy the life of an infant or young child in forty-eight hours, but the ordinary period is from seven to ten days.

Treatment of chronic bronchitis.—From the onset of the attack it is most important to support the patient's strength. It is never necessary to abstract blood, or even to employ antimony, though there may be fine bubbling râles, and other signs of bronchial inflammation. To meet this condition we must rely on the administration of ipecacuanha, squill, senega, and nitrous ether. A warm poultice to the chest, or a turpentine fomentation, is best and safest, with such stimulants as support the circulation and avert the tendency to sinking and fatal prostration. When the pulmonary irritation is less active, the carbonate of ammonia and tincture of bark will be found useful.[*] When the secretion is copious and the bronchial tubes are loaded or obstructed, an emetic of ipecacuanha or sulphate of zinc at bedtime is serviceable. This will often allay the cough and ensure sleep. Alarm may sometimes be caused by children appearing as if they would choke in the act of vomiting, but this never actually happens, and no fear need be apprehended on this ground. I have seen great benefit follow the administration of the syrup of the iodide of iron, with a few drops of ipecacuanha[†] when there is cough, debility, and free secretion in the lungs. Expectorants alone have an injurious effect, and sedatives are equally bad. The necessity of using opium with the utmost caution in young and feeble children, for fear of checking expectoration, cannot be too strongly insisted on. The incessant cough depends on phlegm which has accumulated in the air passages. Opium renders the mucous membrane insensitive, consequently cough is no longer excited, and the child may die asphyxiated from the blood not being sufficiently decarbonised. In older and stronger children, a sedative allays irritation and prevents exhaustion, if the condition of the mucous membrane is rather one of irritation and congestion than of free exudation. When the secretion remains profuse (bronchorrhœa), and the cough is frequent, quinine, the mineral acids (which are very valuable), iron, conium, and cod-liver oil, are most to be relied on. Inhalations of carbolic acid and creosote are very serviceable.

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[*] Form. 67:
℞ Amm. Carb. gr. viij
Tinct. Cinch. Co. ʒij
Syr. Tolut. ℥ss
Aquam ad ℥iv.
M. A dessert-spoonful three or four times a day.

[†] Form. 68:
℞ Syr. Ferri Iod. ʒss
Vin. Ipecac. ʒj
Aquam ad ℥iij.
M. Two teaspoonfuls three times a day.

These prescriptions are suitable for children five or six years old.

Change of air to a warm, equable temperature, and a generous diet, will get rid of this condition. It is at all times important to attend to the ventilation of the sleeping apartments, which should be dry and airy, neither too cold nor too hot, but as uniform as it is possible to make them. Flannel should be worn next the skin, and the feet kept warm.

CHAPTER XXXVI

PLEURISY

SYMPTOMS—*Of the acute form—General and local.*—CAUSES—*Cold and exposure—Rheumatic fever—The exanthemata—Tubercle—Local injury.*—DIAGNOSIS—*Generally easy of recognition, but may be mistaken in some cases for tuberculosis or broncho-pneumonia—In exceptional cases for abdominal disease or encephalitis when severe headache or delirium is present—Means of distinguishing the several affections.*—PROGNOSIS—*Favorable when the effusion is moderate and the disease is uncomplicated.*—MORBID ANATOMY—*Dryness of pleuræ—Effusion of coagulable lymph and pus—Adhesions—Extreme effusion.*—TREATMENT—*Leeches—Warm poultices to the affected side—Calomel and opium—Sudorifics—Mild purgation.*—CHRONIC PLEURISY—*Causes—Symptoms—Terminations—Treatment.*—EMPYEMA—*Causes—Symptoms—Physical signs—Diagnosis—Paracentesis thoracis—Method of operation—Risks attending it—Simple tapping—Aspiration—Use of the drainage-tube—Indications for the employment of tapping—Injections into the pleural cavity—The coexistence of empyema with pneumothorax—Treatment of empyema by removal of a portion of rib—Constitutional treatment of empyema.*

ACUTE PLEURISY, or inflammation of the membrane which invests the lung and thoracic walls, is a most painful affection, since the inflamed visceral and parietal layers of the pleura must necessarily rub against each other during inspiration and expiration, so that rest cannot be afforded them.

Pleurisy when uncomplicated with pneumonia is held to be rare under five years of age. Still it must be admitted that the disease is more frequent in early life than is generally supposed; for in the absence of dyspnœa the chest constantly escapes examination, and even if it does not, a limited degree of inflammation of the pleura is not easy to diagnose during life.

Symptoms.—The *acute* form generally begins with a rise of temperature and occasionally by convulsions, soon followed by catching pain in one side of the chest, limited to one or two intercostal spaces. If pressure be made over them, the patient winces and cries out. The pain generally commences above and to the left or right of one nipple, and extends through the sternum, or up to the axilla. Sometimes the pain is referred to the upper part of the abdomen, and is accompanied by vomiting. The pain at each inspiration resembles that caused by a sharp instrument penetrating the side. In some cases nearly the whole side is affected. Usually a short dry cough soon succeeds, and the respiration is hurried and interrupted. The pulse is frequent, hard and small, and it may be tense; the countenance is distressed and anxious if the pain is acute; the face is sometimes flushed and there is headache; the skin is hot, but moist, and the tongue coated.

The urine is frequently scanty and high coloured; its specific gravity is also high, and as in many other acute inflammatory disorders, there may be a trace of albumen from venous congestion. In other cases the urine may be normal in all respects or contain phosphates.

The fever is sometimes high, but it is subject to great variation. There may be very acute pleurisy with a temperature not exceeding 101°; in some cases it reaches 103° in the evening, falling in the morning to 99° and it may not rise higher during the course of the disease, unless the child is delicate or strumous. In the case of a boy, eight years of age, who came under my care in November, 1884, the highest temperature was 101·4° on admission; on the fifth day the morning temperature was 99°, the evening 100°; on the fourteenth day in was normal. In this case there was great pain in the side, dulness from the spine of the scapula downwards, and a grating friction murmur. There are exceptions to this general condition, the pain being much less in some cases than in others; it may be absent, and the breathing may be unaffected even when the physical signs indicate considerable effusion. Indeed, very rapid effusion of necessity relieves the characteristic pain, by preventing friction between the opposed surfaces of the pleuræ. In some cases quick breathing and debility are the only symptoms which accompany effusion.

Dyspnœa is a symptom which is apt to mislead the young practitioner, more importance being attached to it than it frequently deserves. It is often present at the commencement of pleurisy, when the pain in the side is acute, and before the effusive stage has been reached. The child does not inflate its lung by a full inspiration, because the effort increases the pain caused by the movements of the thoracic parietes. As effusion goes on, the pain diminishes, and the respiration scarcely exceeds the rate of health, when the sound lung comes into play from apex to base, and takes on additional work.

The position which the patient assumes in bed is variable. The decubitus is usually dorsal, but an upright posture is sometimes selected and the pain and distress in breathing are so great that it is impossible to lie down. The child cannot lie on the affected side if there is much pain; on the other hand, lying on the sound side generally causes discomfort, as extra work is imposed on the uppermost lung. I have, however, seen a child lie on the sound side throughout the illness; indeed it will assume any position which enables it to breathe most easily.

Physical signs.—These vary with the stage the pleurisy has reached, and according to the strength and constitution of the patient. At the commencement of the illness there is diminished mobility of the affected side in consequence of the pain experienced on inspiration.

On *auscultation*, the pleura being dry and inflamed at an early period of the illness the respiratory murmur is weak and indistinct; a slight friction sound is detected after a day or two, usually in the infra-axillary region from the opposing congested and dry surfaces rubbing against each other. From the spine of the scapula downwards, bronchial breathing, prolonged vocal resonance, and bronchophony may be very distinct, whilst in the axillary region small or coarse crepitation may be heard in some cases, proving that the pulmonary tissue is involved. It will be understood that when the disease is complicated with bronchitis or pneumonia the physical signs of these diseases will be present. In other cases the respiration is rather jerking, and no moist sound whatever is heard in the affected lung, at the beginning of the disease. The friction sound varies a good deal in its character. When the case is seen early it may be of a superficial scraping character, with some crepitation, heard independently of it, over or at the seat of effusion. Later on the friction sound becomes more rough and grating. In some cases it has a peculiar jerking interrupted sound as if some structure was suddenly dislocated, whilst if the hand be laid over the part, a sudden rough jerk is communicated to it as though a rib had slipped over an uneven surface. The sound disappears when adhesion takes place between the surfaces in apposition, as I have explained when speaking of pericarditis.

Percussion.—The pain and tenderness of the affected side are often so great that such examination cannot be attempted at the beginning of the complaint. The resonance is unaltered, or at most it is only slightly diminished in uncomplicated pleurisy. When effusion takes place, the dulness is greater, and it may be termed absolute, if the fluid is considerable, but in recent cases, when it is moderate in quantity, and the lung has not suffered compression, then the note becomes resonant if the patient shifts his position, and lies on the sound side. When he lies on his back the note is resonant over the front of the chest. When he lies on his face the fluid gravitates to the front, and the note is dull in this situation, though if adhesions be present, the fluid may be prevented from shifting.

The uppermost part of the chest always elicits a hollow sound when struck, varying of course with every attitude of the patient. This is a valuable diagnostic sign. Again it may be noticed that if the upper portion of the lung has escaped compression and the effusion does not extend above the nipple line, the percussion note is so clear as to be tympanitic. Respiration is heard in the affected lung down to the effusion, but in severe cases, when the pleural cavity is nearly full of fluid, and the lung is much compressed, the whole side is dull. The respiratory murmur is absent or there is bronchial breathing, with bronchophony along the spine. Of course the sounds are altered and modified according to the extent of effusion. Above the line of effusion the breathing is often harsh, tubular, or hollow, vocal vibration is increased, and in the interscapular region the respiration may be loud and blowing, and the voice bronchophonic. The unaffected side of the chest is hyperresonant, and the breathing puerile.

In the stage of effusion, the movements of the chest wall on the affected side are diminished, varying of course according to the amount of fluid poured out. If the effusion be considerable the lower part of the chest wall bulges out, and if very large, there may be a more general enlargement of the affected side, a wider separation of the ribs, and obliteration of the intercostal spaces. Vocal fremitus is diminished in small effusions, and abolished in large ones.

In those cases where effusion takes place early and is considerable, there may be no bulging of the intercostal spaces, and no apparent difference can be detected in the movements on the two sides of the chest, but if the effusion is large, the affected side is rather square than rounded, and the liver, spleen, and heart undergo displacement. If the effusion be on the right side, the cardiac apex may be displaced to the left, external to the line of the nipple. If on the left side, the cardiac apex may be felt beating at, or near, the ensiform cartilage.

In cases of extensive effusion in children whose chest walls are thin, fluctuation may be detected between the ribs, and the surface is smooth, tense, or even œdematous. If the chest is examined carefully from before and behind, enlargement may be detected over the inferior ribs of the affected side. This is often very apparent when the child is sitting up in bed, and the physician examines the chest from behind. He is apt to think that the diseased side invariably measures more than the sound one, but there may be considerable effusion without any increase in its dimensions. A good deal of fluid may be present in one pleura without causing the side to become larger. If several ounces are present, the measurement of the diseased side may not exceed the sound one by more than an inch. This is best ascertained by using the cyrtometer. I have had many opportunities of observing this fact in the pleuritic effusions of women, which sometimes result from the pressure of ovarian and other abdominal tumours obstructing the circulation.

The elasticity or power of expansion in the chest wall depends upon its thickness, and the age and strength of the patient. Hence it is that in children the ribs act with greater freedom than in adults, and the ligaments and muscles easily stretch before any force that may be brought to bear on them.

Andral* speaks of great dilatation of the thorax by the fourth or fifth day of an acute attack; and Dr Fuller also states that there may be bulging in the lower part of the chest wall before the end of the third day, and that other cases are recorded where the chest is considerably enlarged before the end of the fifth day. He says this early enlargement occurs only in childhood, and in those children only in whom the costal pleura has suffered severely. The intercostal muscles being at the same time paralysed, and the remaining tissues softened and infiltrated with serum, the chest walls readily yield to the outward pressure.[*] In short, enlargement of the affected side of the thorax is the rule in cases of extensive pleural effusion during childhood, but is, as I have said before, by no means invariable.

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* 'Principles and Practice of Medicine,' by Sir T. Watson, Bart., 1857, vol. ii, p. 116.

In ordinary cases, after three or four days, the pain and fever abate and convalescence begins.

Terminations.—The disease may end in resolution, and if the quantity of fluid poured out be small it is quickly absorbed. It may terminate in adhesion of the two pleural surfaces, or in effusion and empyema. Pleurisy may extend to the pericardium and involve it in inflammation.[†]

If uncomplicated with tubercle or pericarditis, pleurisy is seldom fatal. The stage of absorption and resolution is characterised by the elasticity in the chest walls being regained, and by a return to the normal size. If there has been considerable effusion, the intercostal spaces lose their distension, and vocal vibration returns; the percussion note gradually becomes clearer as the effusion is absorbed, and the lung begins to recover from compression, except where the exudation is thick and plastic, and then the dulness is permanent. This is particularly the case in the lower portion of the chest, in the axillary line. The dulness which remains after all acute symptoms have passed away, and air freely enters the lung is constantly to be detected.[‡]

The respiratory murmur slowly returns, at first weak, short or harsh, but later on full and complete, as in normal respiration. During this process of absorption, the rubbing of the pleural surfaces one against the other, as at the commencement of the disease, sometimes produces a friction sound, as in pericarditis, when the effused fluid is taken up and comes in contact with the roughened pericardium. If the friction sound persists for a long time, and the general health is delicate, or there is a rise of temperature towards evening, it is suspicious of tubercle in the lung or pleura.

Compression of the lung depends on the extent of effusion. If slight it only affects the lower lobe; but if the cavity be nearly full of fluid, and it has been collecting for some time, then it will squeeze the lung against the vertebral column, and increase the dimensions of the chest. In a case of thoracentesis recorded by Dr Sansom, the lung of a child, twelve years of age, was reduced to the size of a small lemon, and the pleura was thickened and ulcerated.*

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[*] 'Diseases of the Lungs,' 1867, p. 181.

[†] Vide Chap. XL, on "Pericarditis."

[‡] Whilst these pages are passing through the press, a case now under my care at the Samaritan Hospital illustrates the point in question. Dr West remarks that this subject has not received a satisfactory explanation (Op. cit., 1884, p. 388).

In the stage of absorption, the exudation that has been thrown out disappears, and the two layers of the pleuræ unite together by means of the lymph, which becomes changed from a soft structure into a fibro-cellular membrane of variable consistency, in some cases firmly uniting the ribs to the pulmonary pleura, and in others leaving a distinct space between the points of attachment. As the upper part of the chest wall is in closer contact with the lung than the lower part, adhesion is more common in this situation; whilst in the latter the effusion gravitates to the lowest part of the pleural cavity, and the ribs are more active.

Causes.—The disease often follows cold and exposure. It may occur in the course of rheumatic fever. One of the worst cases I ever witnessed was in a boy, twelve years of age, who was suffering from acute rheumatism complicated with pneumonia of the left lung. It may happen during the exanthemata, particularly scarlet fever or measles; or be excited by pericarditis, or tubercular infiltration of the lung. It may also accompany albuminuria. Dr West mentions two cases which followed peritonitis. A case recently under my care originated in a kick on the chest wall.

Diagnosis.—Pleurisy is not generally difficult of detection. The presence of fever, with acute and catching pain in the side, aggravated by a full inspiration, distinguishes it from pleurodynia, with which it can scarcely be confounded, and the physical signs clear up its true nature. It may be mistaken for pneumonia, but the fever of pleurisy is not so high, it is more subject to fluctuation, and there is not the same prostration of strength. But the difficulty arises later on when effusion occurs; and then if the disease is complicated with bronchial congestion, pulmonary tubercle or broncho-pneumonia we may be doubtful as to the presence of fluid. These diseases are, however, most frequently bilateral, whilst a pleuritic effusion is rarely so, though serum or pus has been present in both pleural cavities at the same time.

The difference in dulness between pneumonia and pleurisy is a great help in diagnosis. In the latter affection it is first detected in the lowest part of the thoracic cavity, and as the disease proceeds it is heard over the whole chest, which is rare in pneumonia. Taking into consideration the intense and absolute dulness in pleurisy, the greater rapidity with which it occurs (sometimes within twelve hours from the commencement of the disease), and the effusion which may displace the heart and mediastinum, we have good grounds for framing a diagnosis between the two affections. Occasionally œgophony is heard, another characteristic sign of pleurisy when fluid is poured out around the larger bronchi, and the lung is compressed by it.

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* 'Med. Times and Gazette,' December 18, 1875.

Pleurisy sometimes commences with so much headache and delirium that it has been mistaken for encephalitis. If there is vomiting, and the cough and pain in the side are slight, and the respiratory murmur is simply weak, and no friction-sound can be detected, we may overlook the complaint. Pleurisy sets in with more fever than is present in meningitis, the heat of the head is not so great, and there is no squinting or intolerance of light. The child, if old enough, can answer questions intelligibly. If we carefully review the history of the case, and consider the way in which the disease has begun, we can scarcely fall into error.

Diaphragmatic pleurisy rarely occurs in children. If the outset of the disease is attended with purging, which is not infrequent, and the pain is referred to the abdomen and right hypochondrium, instead of to the side, and if, moreover, there is bilious vomiting, our attention may be diverted from the chest to the abdomen; but a careful consideration of these symptoms, with cough, strong fever, and urgent dyspnœa, and the information gained from auscultation ought to prevent us from falling into error.

Prognosis.—When pleurisy attacks a healthy constitution, and is of recent date, the prognosis is favorable; but if complicated with pulmonary phthisis, and the child is of a strumous or rickety constitution, or if there is great debility, then it must be viewed in an unfavorable light. In children of a few months old the disease is very fatal. If the fluid is serous and so moderate in quantity as not to seriously interfere with the circulation it may be entirely absorbed; if very extensive, the withdrawal of a portion may be followed by absorption of the rest. When purulent or fœtid, as in empyema, there is no probability of a spontaneous cure, and the sooner it is removed the better.

Morbid anatomy.—In the first stage the pleura is drier than in health; its smoothness and transparency are diminished, and its surface is more or less vascular. In the next stage, or that of effusion, a variable quantity of serum may be present in the pleural sac, either very transparent, or of a pale lemon colour, or it is sero-purulent with loose flakes of lymph. In exceptional cases the fluid is of a reddish tint, due to the presence of blood thrown out by the vascular membrane. Layers of thick lymph may also in some cases be seen deposited on the surface of the lung, glueing it to the costal pleura, and preventing the movement which normally takes place between them. The character of the exudation varies from time to time, according to the health of the patient and the changes that take place in the affected membrane. It may be serous at first, and then become sero-purulent or even purulent. Post-mortem evidence of pleurisy, without pneumonia, has been detected in the youngest children. The case of an infant, a few days old, at the Paris Foundling Hospital is alluded to by Dr Barlow, where two ounces of sero-sanguinolent pus were found in the left pleura, &c. Of fourteen cases of pleural effusion under his care between the ages of eleven months and two years, "eleven were purulent, two were serous, and one was serous with thick lymph."*

Pleuritic effusion is most frequently met with on the left side of the thorax. The more serous the fluid, the more readily is it absorbed. When purulent, or sero-purulent, it disappears very slowly, and only then if the quantity is small.

Treatment.—On our knowledge of the exact pathology of each case must rest our line of treatment.

When the disease attacks a strong and healthy child, and he is seen at an early stage, and the pain in the side is severe, three or four leeches applied to the painful part will be likely to arrest the inflammation, and favour resolution; whereas, if depletion be neglected the disease may run into effusion or suppuration, and recovery be difficult and protracted.

In most cases a large jacket poultice applied to the side will relieve the pain and relax the tissues without the necessity for abstracting blood. When pain is severe our first step should be if possible to arrest it, because its continuance prevents sleep and is more exhausting than any depleting measures.

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* "On Frequency of Pleural Effusion in Infancy," 'Lancet,' 1878, vol. ii, p. 877.

At the commencement of the disease, when the vessels are first overloaded and engorged, a small dose of antimony given every four hours with the solution of acetate of ammonia, and two or three minims of laudanum (according to the age of the child), will lower the pulse and promote diaphoresis. But antimony is far less beneficial in pleurisy than in pneumonia; and unless the case is complicated with the latter affection, it is quite secondary to calomel and opium. Nevertheless, free sweating wonderfully relieves the pain, and the remedy is well calculated to cut short the high inflammatory fever in a robust constitution. Calomel, or the Hyd. c. Creta, with two or three grains of Dover's powder, is a good combination; and if there is not much pain the mercurial may be given with nitrate of potash and James's powder. (Form. 62.)

A mild purgative dose ought to be given early in the disease to open the bowels, if the pain is not acute enough to be increased by the muscular exertion which it involves.

When the acute symptoms have subsided and all fever has departed, counter-irritation to the affected side, in the shape of blisters, with the perchloride of mercury and bark internally, will get rid of any fluid that may remain. But a blister should not be applied till the chronic stage is reached and the pain is diminishing. Then it does not increase the local mischief, whilst it promotes the absorption of any fluid that may be present. A succession of flying blisters is preferable to one allowed to remain long enough to cause troublesome vesication and soreness. For it should be remembered that obstinate sores and great weakness are prone to follow their use in young children. They should not, therefore, be employed without carefully considering the grave results that may ensue.

When effusion has taken place to its full extent, we should not hastily interfere by operation if the patient breathes in tolerable comfort, and the other lung is acting well. But if there be much distress, and the blood does not pass freely into the right cavities of the heart, tapping should not be delayed.

The diet in acute pleurisy should be strictly antiphlogistic.

Chronic pleurisy.—The causes which usually induce this condition are the consequences of the acute form, or of pleuro-pneumonia. The effusion which has taken place is slow of absorption, or resists it altogether. If there is fever and the general health is cachectic or much impaired, the effusion may become permanent, and no relief can be afforded except by a surgical operation. Chronic pleurisy, however, cannot always be traced to the acute form. It sometimes steals on imperceptibly in delicate children, and is only ascertained when a careful examination of the chest reveals the cause of the chronic cough and breathlessness. It may attend the dropsy which follows scarlatina and renal disease, or the anæmia of strumous and badly-fed children. It may also arise from the irritation of tubercle exciting a low form of inflammation in the pleura and leading to copious effusion. In these last-mentioned instances the disease is of a subacute or latent form.

The *signs* that follow the effusion of fluid in the pleural cavity in the chronic state are similar to those of the acute. There are universal dulness on percussion and an absence of vocal vibration; normal respiration is replaced by bronchial or tubular breathing, or it may be entirely absent, and dyspnœa, accelerated pulse, failing health, and loss of flesh are to be noted. In some cases there is hectic fever. The breathing is not always difficult in the absence of tubercle. The effusion may be considerable, and the lung on the affected side may be prevented from expanding; and yet the breathing may be tranquil and cough absent, when one lung is sound and healthy. More particularly is this the case when the effusion has been gradual and the functions of the lung diminished by degrees. And it should also be borne in mind that a small effusion may act as an irritant and cause much embarrassment in respiration, when a larger effusion has no such effect. If the effusion is copious, and has lasted for some time, the functions of the lung become gradually impaired or even lost altogether.

Terminations.—Both air and blood are forced out of the pulmonary tissue by the compression to which it is subjected; and hence the lung, in long-standing cases of effusion, becomes flattened, tough, and contracted. It never completely re-expands, and therefore when the fluid is reabsorbed the chest falls in, the sternum is flattened, the diameter of the chest is diminished, and the spine is curved. The pleura becomes much thickened, and in some cases ulcerated. The muscles are more or less wasted, the patient walks much less erect, and leans towards the affected side. The puerile respiration in the sound lung, which has been recognised during the effusive stage, leads to more or less enlargement of the air cells and dilatation of the bronchial tubes.

When the effusion into the left pleural sac is considerable, the apex beat can be sometimes felt to the right of the sternum. "I have observed that in children there is, as a rule, less visceral dislocation than in adults. The diaphragm is not so often driven downwards, nor is the heart thrust away so frequently from its position. Their yielding chest walls expand, and percussion discovers but occasionally that the heart or liver is displaced."[*] In chronic pleurisy, with extensive effusion, the patient cannot lie on the sound side. It is said by some authorities that syncope and irregularity of the heart's action are more common when the effusion is on the left than on the right side. This seems quite possible, for the fibrous adhesions which bind the lung to the spine may limit the heart's movements.

The *treatment* of chronic pleurisy is altogether different from that of the acute form. In the former the diet must be more liberal, and good food and wine will in some cases be needed. It may be necessary to apply a blister from time to time, followed by the application of iodine. The affected side of the chest should be painted with tincture of iodine, diluted with water (one in four), night and morning, and then covered with two folds of flannel and calico like a half waistcoat in shape.

Iodide of potassium, with bark, or small doses of perchloride of mercury, squill, digitalis, or acetate of potash may be administered. When the urine is scanty or high coloured, and the effusion is of a chronic or half inflammatory character, diuretic remedies are of value. Dr Gairdner speaks highly of cream of tartar electuary in acute and chronic cases of effusion, which not only stimulates the kidneys, but keeps the bowels freely open, if they are not already so. It consists of cream of tartar, mixed with equal parts of honey, treacle, or marmalade, and of this a small teaspoonful or more may be given according to the age of the patient.[†]

If the child is weak and anæmic we must have recourse to tonics in order to maintain the general strength and to promote the absorption of the fluid. Among them the preparations of quinine and iron are invaluable, given alone or in combination. If the kidneys are sluggish in their action, and the tongue is clean, the tincture of the perchloride of iron will prove one of the best of remedies. The syrup of the iodide of iron, the syrup of the phosphate of iron, and the soluble dialysed iron will furnish good results in some instances. The mineral acids (Form. 14, 20, 21), liquor strychniæ, with phosphoric acid, and the tincture of bark, are likewise indicated in special cases. Cod-liver oil should be given in all chronic cases. The skin should be kept in a healthy state by an occasional bath, and even friction over the affected side will in some degree assist in favouring absorption. Above all, the action of the liver and bowels should be efficiently maintained, so that a free elimination of morbid matters may take place through the chief excretory organs.

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[*] "On Pleuritic Effusions," by Dr Wardell, 'Brit. Med. Journ.,' 1874.

[†] 'Clinical Medicine,' 1872, p. 297.

When the health is sound and the effusion is serous in character, every opportunity ought to be given to promote absorption of the fluid before resorting to thoracentesis.

Empyema.—This is extremely frequent in children.[*][†] When the effusion resulting from chronic pleurisy remains unabsorbed and there is pyrexia, we may suspect that it has become purulent, more especially if there is in addition any cerebral disturbance, or profuse perspiration. The fluid becomes transformed into pus much quicker in some cases than in others, but no exact time can be stated with accuracy. In some instances it remains serous for weeks together, and in others it is purulent at the end of a week or two.

Causes.—Empyema may arise from pneumonia, the exanthemata, and particularly scarlet fever. Oftener it is a primary affection. When the surface of the body is exposed to prolonged cold, and the skin ceases to act, extra work is thrown upon the serous membrane, and hence pulmonary congestion may set up such changes in the lymphatics of the lung and pleura as result in empyema. Empyema rarely springs from tubercle.

Symptoms.—The signs of pleuritic effusion which have been already considered are those of empyema, and without using an aspirator we are often in doubt. Whether there be a simple serous effusion, or pus, the symptoms are very similar; there is dyspnœa, increased by lying down or walking, a sense of constriction or discomfort in the chest, and dry and frequent cough, with or without expectoration.

A peculiar anæmia, with an earthy complexion, and, above all, clubbing of the finger ends, suggest empyema, rather than serous effusion.*

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[*] "Out of forty-four consecutive cases of pleurisy admitted as in-patients at Great Ormond Street, twenty-seven were empyemata. Taking another series of sixteen cases, fourteen were empyemata."—*Notes on Pleuritic Effusion in Childhood*, by T. Barlow, M.D., and R. W. Parker, 'Brit. Med. Journ.,' vol. ii, 1877, p. 759.

[†] "Of 34 cases under the care of Dr Cheadle, all, with one exception, occurred in children under twelve years of age, the youngest was nine months only, the eldest ten years. In all but three, paracentesis was performed. In one spontaneous evacuation took place through the lung, in the second the empyema was secondary to acute pyæmia, in the third repeated exploration failed to find the pus containing cavity. Of the 34 cases, 21 recovered and 13 died."—*The Lancet*, 1881, vol. ii, p. 787

Generally the face is anxious and pale or dusky, the pulse is quick, and the pulsations of the heart are readily affected in force and frequency by trifling causes. Pallor, emaciation, fever, sweating, and diarrhœa, are the most frequent symptoms of empyema. When a portion only of the serous membrane of the pleura is affected it is termed a localised empyema.

Physical signs.—On inspection of the chest there may be nothing observable. The affected side is sometimes a little flatter than the opposite, and its movement is impaired. The intercostal spaces may be obliterated, and the ribs bulging, so that the side is larger from distension, but it is now and then positively smaller. Dr Wilks says that localised dulness, absence of breath-sound, and distant tubular breathing, after an acute attack of pleurisy or pleuro-pneumonia, are proofs of empyema.† If the effusion is only moderate, and not of sufficient standing to seriously impair the resiliency of the lung, then, as in the serous form, the dulness will vary with the position of the patient, and if he be made to lie on the unaffected side, the part of the thorax which before was dull may become resonant in consequence of the fluid gravitating to the lowest part of the pleural cavity. "When the liquid has for a long time been effused, the intercostal muscles, from having been continuously stretched, lose their contractile power, become paralysed, flat, and then even tend to protrude. Albertini supposed, and Stokes believed, that such state denoted pus."‡

Diagnosis.—Of all the signs of fluid in the chest, whether serous or purulent, the dull heavy thud which percussion elicits is the most certain. Whenever fluid in any quantity is collected no resonance can be produced. Resonance extends to the limits of the effusion, varying with the position of the trunk, unless the pleuræ have become thickened and adhesions formed between them.

With regard to temperature, though ordinarily it is fluctuating, and there is an evening rise, it may be normal, particularly if there is great emaciation and the disease is chronic. When suppuration is going on in any organ there is usually considerable elevation of temperature in the evening, and this is especially so in children. It may be normal in the morning and run up to 102° or as high as 104° in the evening. But it is not invariably so either in empyema or in some other cases of suppuration. I have recorded the case of a child in which scattered abscesses were found in the kidneys, and the bladder was inflamed and hypertrophied, yet there was no fever at any time. The case resembled one of pyæmia. The child was emaciated and greatly reduced in strength.[*]

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* "Notes on Pleuritic Effusion in Childhood," by T. Barlow, M.D., and R. W. Parker, 'Brit. Med. Journ.,' 1877, vol. ii, p. 759.

† "Local Empyema: its Diagnosis and Treatment," 'Brit. Med. Journ.,' vol. i, 1879, p. 528.

‡ "On Pleuritic Effusion," by R. Wardell, M.D., 'Brit. Med. Journ.,' 1874.

If the temperature be high in the evening it is in favour of pus forming, but pus may form although there is no such elevation. Again, the temperature may be high in cases of simple serous effusion, when not a particle of pus is present.

An empyema when left to itself may dry up and disappear by absorption. In rare instances, the pus may find its way through the diaphragm into the abdominal cavity and set up peritonitis, or it may perforate the lung tissue and be discharged through the bronchus, even after paracentesis, and the child then recover.[†] A case is recorded in which an empyema in a girl, ten years of age, burst into the œsophagus.[‡]

Paracentesis.—The operation should be delayed till the pyrexia has passed away and the patient is in a quiescent state. But the fact of an elevation of two or three degrees of temperature ought not to stand in the way of an operation, if the fluid is in such quantity as to have resisted absorption, or if it is purulent.[§] In either case the temperature generally falls when the fluid is drawn off, and the patient breathes more easily, and is in all respects better. The indications which appear to justify thoracentesis are failure in the process of absorption, so that the fluid remains compressing the lung, and causing urgent dyspnœa, irregular pulse, and feebleness of the heart's action; or when the fluid becomes fœtid, and produces such constitutional disturbance that the patient is in danger of dying from hectic fever and septic poisoning.

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[*] ‘Medical Society's Proceedings,’ 1884, p. 445.

[†] ‘Brit. Med. Journ.,’ vol. i, 1880, p. 850.

[‡] ‘Steiner's Diseases of Children,’ 1874, p. 170.

[§] Dr Sidney Ringer has recorded some cases of pleuritic effusion in young children in which paracentesis was performed with immense relief, and with very little disturbance to the general health. Dr Ringer says his cases show that the operation may be performed during the febrile and non-febrile period of the disease, that the fluid may be withdrawn by the aspirator during the fever, without any reaccumulation; that in some cases of febrile and non-febrile empyema, a part of the pus may be withdrawn by the aspirator, and the rest disappear. They further show that in severe empyema the temperature may be normal, or nearly so. (‘Practitioner,’ 1873, vol. ii, p. 408.)

It is most important when tapping has been performed, to see that the pus finds a ready way of escape. If a drainage tube is used it should be frequently examined, especially if there is any accession of fever or constitutional irritation; it may have been twisted or blocked up at its inner opening by a clot of pus, or in some way the escape is checked. If the temperature falls we may conclude that the opening in the tube is re-established, and that the danger of purulent infection is over. Moreover, if the patient breathes fully, air will be heard to enter and leave the chest.

A case of pleuritic effusion, probably unique from the tender age of the patient and the operation of paracentesis, is recorded by Dr Cayley, where a well-grown male infant, fed at the breast, suffered from cough and difficulty of breathing of one week's duration before any relief was sought. When seen by Dr Cayley (Oct. 22nd, 1878) there was extreme dyspnœa and rapid respirations, tossing of the arms about, and throwing back of the head. There was a frequent, short and abortive cough. The whole of the left lung was dull on percussion, and there was an absence of breath sounds. The heart's apex beat to the right of the sternum. Paracentesis was performed below the angle of the scapula by means of a trocar and canula, and "eight ounces of turbid serum were drawn off by a bell-jar aspirator." A fortnight after the operation there was still cough, but the child appeared well. There was impaired resonance at the left base, and the breathing was tubular—symptoms not unlike a refilling of the pleural cavity.*

After paracentesis, when serum only is evacuated, any fluid that remains behind may become purulent and the patient die. As long as the fluid is simply serum every chance should be given to the persevering use of blisters, iodine, and other local remedies; but when it is purulent, which can only be positively ascertained by passing a grooved needle, or, still better, a carbolised hypodermic syringe, through an intercostal space, the sooner it is got rid of the better. It is nothing more nor less than an abscess, and must be dealt with accordingly. When pus is drawn off by tapping, recovery is invariably slow, because the extensive area of the pleural membrane is in a state of chronic inflammation, and the lung may be bound down through thickening and the formation of false membrane.

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* "Pleurisy with Effusion in an Infant four months old, Paracentesis, Recovery."—*Lancet*, vol. ii, 1878, p. 807.

The operation having been decided upon, an anæsthetic should be administered, in order to keep the patient quiet and to abolish pain. I have used the bichloride of methylene in several cases, without inducing the slightest danger, the pulse often improving under its administration. Every child should be anæsthetised whose chest requires tapping. The danger arising from it is practically *nil* if carefully administered, and infinitely less than would follow the tedious and painful operation of puncturing the chest wall during consciousness, at a time when the child is already weakened and terrified. Antiseptic precautions are to be adopted.

If the effusion be on the left side it is customary to make an opening in the fifth intercostal space, if on the right side in the fourth intercostal space, midway between the spine and the sternum (infra-axillary region), then to introduce a probe and to pass it downwards to the lower part of the pleural cavity above the diaphragm. The point having been felt beneath the skin an opening is made upon it, and a drainage tube is pulled through, and the two ends united. Trousseau recommends the sixth or seventh intercostal space in the axillary line. It has met with warm advocates in this country, and is preferable to making an opening below the angle of the scapula, because the patient lies on the back, and the part is subjected to friction, pressure, and other inconveniences.

Simple tapping may be had recourse to if the effusion is serous, and the operation may be repeated from time to time, so as to give the cavity a chance of contracting, and the lung of expanding. This has happened in some cases. But if the collection be purulent permanent drainage must be established.

Another plan, recommended by Mr Howard Marsh, is to procure a No. 3 catheter, and by means of a silver wire to push "from the eye to the handle end" a strong silk ligature, hanging out at either end. The catheter is introduced through the upper opening, and its point is directed to an intercostal space at the lowest part of the pleural cavity. An incision is made upon it, the silk seized and held firmly while the catheter is drawn out of it as it was introduced, and a drainage tube being attached to the silk it is drawn through the two openings.*

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* 'The Surgical Treatment of Empyema," 'Brit. Med. Journ.,' 1877, vol. ii, p. 887.

When the fluid drawn off by the aspirator or hypodermic syringe is purulent, and there is accumulation from time to time, a permanent orifice should be maintained by means of a double opening, one anteriorly, and the other below the angle of the scapula, through which a piece of drainage tube is passed, and secured at both ends in the manner previously described.

The patient has a better chance of doing well when there is only necessity for one opening.

During the operation the admission of air into the pleural sac should be carefully guarded against lest it produce suppuration in the sac; "still there is a considerable body of evidence to show that the admission of air to the cavity of the thorax, when serous effusion exists, does not *necessarily* induce purulence. I may, however, remark that such an accident should be regarded as dangerous; but it is a danger not always easy to avoid, and it should be taken seriously into account among the risks of the operation."[*] The best form of aspirator is that in which a special receiver is dispensed with, the tube of the aspirator being set in a plug of vulcanite india rubber; this can then be fitted into the neck of any ordinary bottle. This convenient modification of the aspirator was introduced by Professor Wood. But whatever instrument we employ, it is certain that Lister's antiseptic method properly carried out renders the admission of air comparatively harmless. Mr Berkeley Hill says it is not necessary to aspirate in most cases, as the pressure within the chest will drive out the fluid fast enough, but that the syringe is useful to force back a clot, or shred of lymyh, if such block the tube.[†]

When the acute symptoms are of brief duration, the wound may heal quickly after tapping, though we must not overlook the fact that a fistulous orifice in the pleura may remain open for years, and finally contract and heal up. A girl on whom Mr Berkeley Hill operated for empyema, wore a silver tube from her eighth to her thirteenth year. The cure was perfect, leaving very little contraction over the affected side.[‡]

The physical and general symptoms which justify the operation of paracentesis may be thus classified.

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[*] "On the Mortality of Pleurisy considered in relation to the operation of Paracentesis Thoracis," by Dr Wilson Fox, 'Brit. Med. Journ.,' 1877, p. 725.

[†] "On Tapping and Draining the Pleura," 'The Lancet,' vol. ii, 1875, p. 88.

[‡] Op. cit., p. 88.

1. When the effusion has become chronic, the pyrexia has subsided, and the health is perceptibly declining. Under these circumstances death may take place from suffocation or syncope.

2. When the effusion is so large that the lung is compressed and incapable of expanding. This can usually be ascertained by dulness on percussion and the absence of respiration, by obliteration or bulging of the intercostal spaces, and occasional increase in the dimensions of the side.

3. When the heart is displaced by effusion, or the liver and spleen pushed downwards, and there is irregularity of the pulse and dyspnœa.

4. When the effusion remains copious after the assiduous employment of constitutional and local remedies, and especially if pus follow the introduction of a grooved needle into the pleural cavity.

5. The longer the fluid is allowed to remain in the pleural cavity the more likely is it to undergo pathological changes and to resist absorption.

6. Fluid may be drawn off as it forms from time to time, lest adhesions ensue, and the lung never completely re-expands. Repeated puncture is more likely to prevent the conversion of serum into pus than to hasten it.* The partial evacuation of an empyema may be followed by the drying up the rest.

7. When the functions of one lung are impaired by the mechanical pressure of the fluid and there is bronchitis or pneumonia in the other.

8. A certain degree of fever does not contra-indicate the operation, nor does it necessarily increase the local changes. After tapping, the fever generally falls; and even if hectic fever is present, the free escape of pus through a good-sized opening in the most dependent part of the chest wall will sometimes arrest it entirely.

With regard to injections of iodine into the pleural sac, I have known considerable fever and pain follow their use in the most diluted form. In ordinary cases no such interference with the pleural cavity is justifiable. When there is a copious secretion of offensive pus keeping up the febrile state, a weak solution of carbolic acid, introduced through a flexible catheter, appears to be advantageous. The pleural cavity in one case was washed out for thirty-one days with a weak solution of sulphurous acid, and a good result followed.*

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* Berkeley Hill, op. cit., p. 88.

In long-standing cases of empyema the chest may be contracted and the ribs approximate, so as to produce great deformity, and yet the pleural cavity may be full of fluid, and the diaphragm be pressed downwards.

Empyema may exist with pneumothorax, air having found its way into the cavity of the chest through the pleura lining the lung, or the interior of the chest. A singular case is recorded by Dr Cheadle, in which a boy, ten years of age, who was admitted into the Hospital for Sick Children, April 18th, 1877, had effusion in the right pleura with displacement of the heart's apex. The temperature oscillated between 99·5° and 102°. Between the time of his admission and the August following he was tapped four times. On the last occasion twenty-six ounces of thick pus were removed. There were fever and sweating, soon followed by phlebitis in the right leg, and slight albuminuria. In September a counter-opening was made in the chest, a drainage tube inserted, and the cavity of the pleura syringed out with carbolic acid lotion. Three days before death the respirations became rapid, face blue, cardiac resonance and amphoric breathing over the left nipple. After death the right lung was found collapsed, and the pleural cavity full of air. A hole, lined with lymph, and large enough to admit the little finger, passed through into the pericardium, forming a free communication between it and the pleural cavity. The pericardium was thickened and lined with a thick layer of lymph, as was also the heart. It appeared certain that a condition of pneumo-pericardium existed. There was no sign of tubercle.†

Portions of one or more ribs have been removed successfully in chronic cases of empyema, to allow of a free discharge of pus, and obliteration of the cavity; when simple puncture and the insertion of a drainage tube fail. The object being to obtain the most perfect drainage, it is proposed to remove a portion of rib or ribs at the onset, and thoroughly drain the cavity from the beginning. In empyemas of the base of the lung it is recommended to resect the ninth rib in the axillary line. An incision is made along the course of the rib to be excised, the periosteum is divided longitudinally, and turned off the rib, and about three quarters of an inch of bone is removed with cutting forceps. The cavity is cleared of its contents, and washed out antiseptically with a lotion of carbolic acid (1 in 40). A short india-rubber tube is then inserted, not far enough to project into the cavity. Sutures are passed deeply through the intercostal tissues and the tube to render its position secure. There seems to be no danger of caries. The bony framework is as perfect after recovery as before the operation.*

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* 'Practitioner,' 1878, p. 125.

† 'Brit. Med. Journ.,' 1877, vol. ii, p. 387.

In the case of a child, six years of age, under the care of Dr Taylor and Mr Howse, where pus continued to be secreted two months after the chest had been opened, and hectic symptoms resulted, about 1½ inches of the seventh, eighth, and ninth ribs were removed by means of the bone forceps. The temperature fell to normal and great improvement took place for a time, in consequence of better drainage being established, but the patient died four months afterwards from chronic diarrhœa, and pus in the pleural and peritoneal cavities.†

Constitutional treatment of Empyema.—This is too important to be neglected. Quinine and iron are decidedly of service in some cases, and such remedies as the chief symptoms seem to demand. Diarrhœa, sweating, and cough, must be kept in check. Good diet is indispensable. When an opening has been established, and is likely to discharge for some time without any chance of closing, the patient should obtain the pure fresh air of the country, or some seaside place. I have seen two cases of chronic discharge, which ended in complete recovery when the children were removed from the hospital and obtained fresh country air.

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* "Cases of Empyema in Children treated by Removal of a Portion of Rib," by W. Arbuthnot Lane, B.S., 'Guy's Hospital Reports,' vol. xxvi.

† "A Case of Empyema in which Portions of Ribs were Excised," 'Clin. Trans.,' vol. xiii, p. 19.

CHAPTER XXXVII

PNEUMONIA

THREE STAGES AS IN ADULTS—1 *Stage of engorgement—Congestion or splenisation.—2. Red hepatisation.—3. Grey or yellow hepatisation—Pathological condition of the different stages.*—VARIETIES OF PNEUMONIA—*May be divided in children into three*—1. ACUTE PNEUMONIA (LOBAR OR CROUPOUS PNEUMONIA) *the same disease as in adults, and presents similar morbid appearances—Sometimes complicated with pleurisy—State of the blood in.*—SYMPTOMS IN THE DIFFERENT STAGES—*Local pain—Pungent heat of skin—Cough—Physical signs—Dyspnœa—Abdominal respiration—Pulse and respiration—Urine—Temperature.*—CAUSES—*Predisposing and exciting—Previous state of health, cold, catarrh, and bronchitis—Eruptive fevers—Heart and renal disease.*—PATHOLOGY OF CROUPOUS PNEUMONIA—*Terminations—Usually in resolution, or may end in phthisis or chronic pneumonia.*—PROGNOSIS—*Doubtful in tubercular cases, or where there is heart or renal disease.*—DIAGNOSIS—*From Bronchitis—Tubercular phthisis—Broncho-pneumonia—Œdema of the lungs—Typhoid fever—Meningitis.*—TREATMENT OF CROUPOUS PNEUMONIA—*Venesection not to be discarded in some cases—Local bleeding by leeches—Tartarated antimony—Cold bath—Calomel and aconite—Nitrate of potash—Action of hydrate of chloral and the dangers attending its employment—Bromide of potassium—Poultices and their mode of action—Turpentine stupes—Importance of stimulants if the child is feeble or delirious from exhaustion, and there is no vascular excitement—Treatment of the second and third stages.*—2. CATARRHAL PNEUMONIA (LOBULAR—BRONCHO-PNEUMONIA)—*Relation to bronchitis and the period of dentition—Common in bronchitis* *and whooping-cough—Symptoms—Pathology, Diagnosis, and Treatment—Epidemic pneumonia.*—3. CHRONIC LOBULAR PNEUMONIA—*Nature and causes—Diagnosis from tubercle in the lung—Cases in illustration—Treatment*—ŒDEMA OF THE LUNGS—*Causes and treatment.*

PNEUMONIA is a disease about which so much has been observed and written that it would be strange if its nature and treatment were not better understood now than formerly. The most complete attention has been directed to it, and the physical and general symptoms attending its various stages have been carefully studied by physicians and pathologists. We have recently been taught to regard pneumonia, not merely as a local inflammation, but as depending upon some cause which is not yet understood. If the disease in consequence of this advancement has lessened in mortality among adults, it must still be viewed as a serious one in children. Genuine pneumonia in early life is a formidable and fatal affection (even when it is uncomplicated by renal or cardiac disease); the urgent dyspnœa, and embarrassed pulmonary circulation, are soon followed by coma and death if both lungs are affected, or even if one is rendered nearly useless as a breathing organ.

Pneumonia in children is divided into three stages of inflammation, as in adults, and the same pathological appearances accompany each stage of them. 1. The stage of *engorgement*. 2. The stage of *red hepatisation*. 3. The stage of *grey hepatisation*.

In the *stage of engorgement* the lung is of a reddish brick colour approaching to brown, or it is mottled or livid. It is less elastic, heavier, and softer, and this diminution in its consistence has earned the name of *splenisation*, because it is easily torn like the spleen itself. Some portions of the lung float in water, and others sink from the small amount of air in them, and when a section is made there exudes a frothy and viscid bloody serum containing air.

In the stage of *red hepatisation* the lung has lost all crepitation, and the weight is increased. It is more solid and distended from the amount of fibrinous exudation, and the marks of the ribs are sometimes observed where the lung has been pressed against them. The external aspect presents a deep red colour, and on section the surface is either marbly or of a greyish opaque hue. The granular appearance is the characteristic feature of this stage. Sometimes the cut surface is like a piece of liver. It is produced by the effusion of coagulable lymph into the air vesicles, and is not so commonly observed in children as in adults, or when the exudation is softer and thinner. Scarcely any fluid escapes except on pressure, which is thick, scanty, reddish, and non-aerated. The lung instantly sinks in water.

In the third stage, that of *grey or yellow hepatisation*, the colour of the lung is paler, of a greenish yellow, or of a light grey slate, and, as in the previous stage, it is dense and impermeable to air. The air vesicles are distended with inflammatory exudation, and the lung sinks in water. It is also soft and pulpy, and breaks down under pressure of the finger.[*] On section, a grey yellowish fluid (approaching the consistence and appearance of pus) escapes in considerable quantity, and in bad cases the whole lung becomes infiltrated with purulent matter, which, if the case terminates successfully, is either absorbed or expectorated. This stage very rarely ends in abscess and gangrene.

Sometimes the inflammation is limited to the air sacs, and the mucous membrane of the smallest bronchial tubes is not even congested. There are cases, and they are by no means infrequent, in which the bronchial membrane is so vascular, as to prove the existence of bronchitis.

Symptoms.—The mode of invasion differs as we shall presently see, but it may be here briefly stated that pneumonia usually sets in with shivering, high inflammatory fever, pungent heat of skin, flushed face, headache, furred tongue, prostration of the strength, quick pulse, thirst, loss of appetite, deep-seated pain in the chest, or in one side when the pleura is primarily involved, and a short dry cough. The urine is usually scanty and high-coloured; sometimes there is transitory albuminuria, as in many febrile affections, passing away as the disease subsides. On the other hand, the secretion may be perfectly normal in all respects. In a day or two the cough is looser, and some adhesive mucus is expectorated, of a rusty or varnish colour, though in children of eight or ten years of age there may not be the vestige of expectoration. After this the symptoms subside, the expectoration, if any, becomes muco-purulent, and in the course of ten or fourteen days the patient is convalescent. In other cases the symptoms are more unfavorable; on the third or fourth day the respiration increases in frequency, and if there are sputa they are streaked with blood, the pulse is frequent and feeble, the tongue dry or brown, and delirium or coma comes on, with the attendant symptoms spoken of as typhoid. The last stage is announced by fluttering of the pulse, accelerated respiration, and a sweating clammy skin. There is somnolence and stupor, and the child is as heavy and indifferent as though he was labouring under a narcotic poison. As the fatal issue approaches, the cheeks become pale, and the lips and extremities of the fingers dusky, whilst the temperature falls, and the pulse is gradually extinguished.

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[*] "The grey colour, indeed, which the lung presents is due mainly to the natural pigment which it contains, and thus it happens that a hepatized lung is much darker in aged persons, where more natural pigment exists, than in children, where pigment is almost deficient; thus it is that the hepatized lung of children is white, or yellowish-white." (Wilks and Moxon, 'Pathological Anatomy,' 1875, p. 325.)

Physical signs.—These are indicated by fine crepitation, replacing the vesicular murmur in the inferior portion of the lung, with dulness on percussion, bronchial breathing, and increased vocal resonance. There is puerile respiration in the healthy lung. Dulness on percussion and minute crepitation are the most characteristic signs. If the case pursues a favorable course, the bronchophony and bronchial breathing diminish, or disappear, and large mucous crepitation, or subcrepitant rhonchus takes their place. If the inflammation subsides, the crepitation is gradually succeeded by the healthy vesicular murmur, and the lung again after an indefinite time becomes resonant on percussion. When resolution does not ensue, the bronchophony and dulness increase, and vocal fremitus is absent. But if one lung becomes so consolidated that no air can enter it, there is an absence of tracheal breathing and bronchophony. If the hepatized lung suppurate, and matter is discharged, amphoric breathing and pectoriloquy, as in a phthisical cavity, are to be expected and watched for.

In some delicate and badly nourished children, one or more abscesses may form, which discharge themselves into the bronchi or pleura, or the fluid parts being absorbed they undergo calcareous change and dry up, surrounded by a firm tight membrane. In other cases the fibrinous effusion undergoes contraction and shrinking, and leads to the condition known as cirrhosis of the lung, or "fibroid phthisis."*

We may now consider the different forms and peculiarities of pneumonia to which the lung is liable, and these are the following:

Acute pneumonia (*Lobar or Ordinary pneumonia—Croupous*

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* See Fibroid Phthisis in Chap. XXXIX, "On Phthisis Pulmonalis or Pulmonary Consumption."

pneumonia) presents the anatomical appearances just described. It generally attacks the lower lobe of one lung (*basic pneumonia*) in adults, but in children (with whom it is rare) it may occur in the middle lobe also, and not unfrequently the apex is the only part seized upon, the rest of the lung remaining free. The apex is prone to suffer in quite young children.* When this is the case we may easily attribute the condition to tubercular deposit, though this form of pneumonia does not seem to be more fatal in this part than in any other portion of the lungs, nor does it show a tendency to degradation into phthisis, but undergoes resolution as quickly and completely as any other.†

More or less bronchitis is usually present in croupous pneumonia, pleurisy is very common, and there may be some effusion into the pleural sac. When the attack is severe, the right cavities of the heart are distended, and the heart may be seen beating at the epigastrium; the venous system is full, giving rise to capillary congestion, and enlargement of the jugular veins. The blood abounds in fibrine, and the "buffy" coat is present.

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* The nervous symptoms attending *apex pneumonia* (cerebral pneumonia) in young children are well exemplified in the three following cases. In the first case, a child five years old, was well on June 12th, and came home tired from school. In the evening she was convulsed and lost her senses; the following day there was diarrhœa, thirst, slight cough, rapid respiration, and delirium. On the 18th, when admitted into the Children's Hospital, under Dr Gee, the temperature was 105·2°; pulse 160; resp. 60; there was dulness over the right front as far as the nipple level, bronchial voice and respiration; fine râles on inspiration. The temperature fell on the 19th to 100·2°, and on the 20th to 98°. Recovered July 5th. In a *second* case, a male child, three and a half years old, was in good health on July 9th before 5 p.m., when he came indoors, complained of his head, and tossed about. In the evening he vomited. On the 10th he was drowsy, and could not sit up. On the 13th, when admitted into the Children's Hospital, under Dr Cheadle, he was irritable and prostrate; temp. 104·2°; pulse 160; resp. 52; skin hot; tongue red, and coated with a white fur; right front of thorax dull as low as nipple, and upper half of axilla; respiration weak and bronchial. On the 16th he was screaming, delirious, and constantly trying to get out of bed; temp. 104°. On the 18th there was less delirium, but constant cough. On the 20th temp. 101°; fine crepitation over upper half of right front of chest to nipple. 23rd temp. 98·4°. July 17th went home. In a *third* case, a boy, ten years of age, was admitted into University College Hospital, under Dr Ringer. His mother died of consumption, and he had had a cough the previous winter. Was suddenly taken ill on August 11th, and complained of pain in head, neck, and chest. On admission (four days later) right front of chest dull at apex; increased vocal resonance and fremitus; bronchial respiration. Left back hyper-resonant. Temp. 102·2°; pulse 133; resp. 48; tongue covered with a yellow fur, red at tip and edges; constipation. On the 17th there was vomiting; temp. 98·4°. On the 22nd there was scarcely any difference on the two sides of the chest. Feels well. Secondary pyrexia followed after the physical signs had cleared up, which was considered due to the absorption of inflammatory products, or allied to septicæmia, as there were no signs of tuberculosis. On the 13th of September he was discharged.—"Cases of Apex Pneumonia," 'Medical Times and Gazette,' Oct. 6th, 1877, p. 386.

† 'Collective Investigation Record,' July, 1884, p. 68.

Symptoms.—These are not the same in all cases. In some the complaint sets in slowly, with catarrh or slight bronchitis, for a few days before the lung exhibits dulness, and the usual signs of pneumonia. In other cases the disease commences more suddenly with delirium or convulsions, very rarely with rigor, followed by pain in the chest, and a dry, hacking cough. Another form of attack begins with severe vomiting, and feverishness ensues at the end of two or three days, with pain in the side, cough, and restless sleep, followed by wandering or even delirium at night. The cases beginning with cough and catarrh, followed by headache and pyrexia, vomiting, restless nights, delirium, and attempts to get out of bed, high temperature, great thirst, and tenderness of the abdomen, may last for some days before the disease can be positively diagnosed. Thirst and loss of appetite are usually present; the tongue is covered with a creamy fur, through which the enlarged papillæ project, and there is constipation. In most instances, there is pain in side, or about the mammary region, extending downwards, which may lead an inexperienced observer to think the pain is abdominal. When the pain takes this course there is generally some pleurisy present. The pain is piercing or stabbing, causing the child to cry out if it coughs, or the part is touched. Sometimes there is great stupor and heaviness of expression, heat of head, contracted pupils and prostration of strength. It is difficult to get any direct answer from the patient, who does not seem fully to comprehend any question addressed to him. The face is anxious, and one or both cheeks are flushed, or there is a livid patch upon them; the nostrils are active at each inspiration, which is short and catching; the patient sinks low down in the bed, or lies on one side, with his knees drawn up, and his head bent on the thorax. The skin is usually acrid and pungently hot, but it may be perspiring at an early period of the complaint with no amelioration to the other symptoms, the respiration being equally hurried, and the general distress quite as great. Stupor and indifference are striking symptoms as the complaint steals on, and the cough is choking and subdued instead of being tearing and painful.

The *urine*, as previously mentioned, is often scanty, dark-coloured, and throws down a deposit of pink lithates. The specific gravity is higher than in health, and the urea and uric acid are increased. Albumen may be present from congestion of the kidneys, and there is a deficiency of chlorides. Bile pigment is sometimes to be detected, and epithelial and granular casts. As convalescence is established, the specific gravity becomes lower, whilst the urea diminishes, and the albumen disappears.

Temperature.—This varies from 103° to 105°, or even higher. It should be borne in mind that in cases of free cutaneous action it may never rise high, and yet the disease be severe and dangerous. The temperature is deceptive. In children it is often very elevated where the extent of lung mischief is small. Thus in two children under my care, about the same time, whose respective ages were 12 and 13 years, the temperature reached 104° in both, but in one case there was a considerable portion of lung involved, with severe constitutional symptoms, whilst in the other the pulmonary mischief was slight, and the general state but little altered. In the latter case, the nerve centres appeared to feel the shock of the illness to a far greater extent than the state of the vascular system would account for. As a rule the significance of the temperature must be estimated by comparison with the physical signs. It is seldom that the temperature exceeds 105°, except in tubercular pneumonia. The temperature generally attains its maximum about the third or fourth day, and the fall takes place suddenly. I have known it reach 104° on the seventh day, fall to 98° on the following day, and rise and fall in the same manner for several successive days. From the 16th day of the disease to the time of convalescence a month later, I have observed the morning temperature average 98·4° and the evening to vary from 99·6° to 103·4°. When in addition to this fluctuating temperature there is accompanying it dulness on percussion over the greater portion of the lung, subcrepitant rhonchus, harassing cough, semi-purulent expectoration, and night sweating, we may be in dread of approaching phthisis.

All these symptoms, however, disappear, as the general health improves, and sometimes in a remarkably short space of time.

The pulse varies in frequency from 120 to 140. In mild cases it may not exceed 100, even if the evening temperature runs up to 103°, and the respirations are not more than 28 to 30, but in severe cases the pulse will reach 160, or even exceed this, and the respirations be as frequent as 70 or 80 per minute, particularly where both lungs are involved. The pulse is strong and full in sthenic cases at the beginning, but as the disease advances it becomes weak, small, and running; in other cases it is irregularly intermittent.

Nothing can usually be gathered from the appearance of the sputa, as at first they are scanty, afterwards they are swallowed, unless the child should vomit, when some rusty or sanguineous frothy liquid may be wiped from the mouth, but the symptoms are liable to considerable deviation both as regards the local and general signs.[*]

If the child is young enough to be nourished at the breast, he repeatedly lets the nipple fall from his mouth, because, with a closed mouth, the nostrils do not admit a sufficient quantity of air to the lungs.

Physical signs.—When the constitutional symptoms have reached the point already described, the lung will give evidence of some change. If examined at the earliest period the respiration may be little altered, but in nearly all the cases I have seen, when the general symptoms have attained any importance, some dulness, after a few hours' pyrexia, will be detected over the lung, and there will be heard on auscultation both rhonchus and sibilus. At the lower lobe of the lung (the right base being the commonest seat), fine crepitant rhonchus is heard at the end of inspiration, and bronchial or tubular breathing above of a shrill metallic character from commencing consolidation. The voice or cry reaches the ear distinctly from the thin state of the chest walls. When the sounds just mentioned have taken place, the movements of the thorax on the affected side are restricted, and at each inspiration the intercostal muscles are drawn in, leaving the spaces depressed. If these physical signs continue (which are commonly heard about the third or fourth day), the small crepitation is exchanged for a coarser kind, or that known as subcrepitant rhonchus, the fluid now being more copious in the air vesicles, which are dilated and enfeebled. The true crepitation of this form of pneumonia is of very brief duration in children, and is soon exchanged for the coarser variety. As the disease advances to recovery, the dulness on percussion diminishes, and the crepitation becomes moister and bubbling, whilst the respiration is softer and less frequent. There is in this respect a great difference in cases, the dulness being slow to pass away in some instances, even if it does not become chronic, and the breath sounds remaining feeble, harsh, or moist for a great length of time—in fact a coarse crepitation may remain after many weeks, in defiance of every constitutional and local measure.

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[*] Dr Squire states that acute (lobar, or croupous) pneumonia is not uncommon in childhood. He quotes the experience of Stenitz, of Breslau, with 84 cases, and of Ziemssen, of Berlin, who gives 186 cases of pneumonia, specifically stated not to be catarrhal, of which 117 occurred in the first six years of age, and 69 in the next ten years. Four consecutive cases given by Dr. Squire "commenced suddenly with higher temperature and greater disturbance of respiration and circulation than other acute diseases of childhood." An elevated temperature for five or eight days suddenly subsiding marks these cases.—"On Infantile Pneumonia," read before the British Medical Association at Manchester, August, 1877.

Causes.—These are predisposing and exciting. Among the former are the previous state of health, and the liability to pulmonary disease. Among the latter are exposure to cold in winter and spring, particularly after measles and the eruptive fevers, debility, privation, violent exercise, congestion from heart or kidney disease, or from tubercular deposit in the lung. The combination of cold and wet is particularly favorable to the development of the disease, and exposure to cold when the body is heated. Injury to the chest, or a blow setting up abscess in the walls of the chest, is another ascertained cause.

Pathology.—The epithelial lining is unaltered in croupous pneumonia. The exudation filling the alveoli consists of fibrine and leucocytes, or "exudation cells," which readily undergo fatty degeneration; they are partly thrown off in the sputa, or disappear by absorption, which is quite different to what happens in catarrhal pneumonia. In the first affection the whole lung or one lobe is consolidated, whilst in the last-named variety isolated patches (lobules) are affected, surrounded by pulmonary tissue permeable to air.

Terminations.—Croupous pneumonia generally ends in resolution in healthy subjects. A crisis takes place in the form of sweating or diarrhœa, or there is an abundant urinary discharge, and forthwith all the symptoms speedily decline. This may be usually looked for at the end of a week, when the pulse and respiration become reduced in frequency, but the crisis may not occur for another five or six days, leaving the child prostrate, thin, and pale. In other cases, when convalescence appears to be approaching, a relapse takes place, and the child may die of asphyxia or convulsions, from a clot of fibrine blocking up the pulmonary artery and obstructing the circulation through the lungs; or it drags on, and at last perishes from exhaustion. In another class of cases the udation thrown out is never absorbed, but it provokes fever and cough, and ultimately leads to phthisis, or to chronic pneumonia.

Prognosis.—From the liability of young subjects to tubercular disease, pneumonia is full of peril to the weak and delicate, particularly if the pleura or pericardium has been involved or there is renal or heart disease. If both lungs are affected, and there is copious secretion (especially if dark or prune-juice in colour), the respiration increases in urgency, and collapse is to be apprehended. In such cases profuse perspiration breaks out, low muttering delirium sets in, and the child gradually sinks.

Diagnosis.—Croupous pneumonia is characterised by tubular breathing, fine crepitation, dulness on percussion, elevated temperature, and rapid respiration. Change from the normal ratio between frequency of pulse and frequency of respiration is very marked in this disorder. In any febrile disturbance in young children the temperature is apt to run rapidly high, even in dentition, but then it is of very brief duration compared to pneumonia, and in bronchitis it is not usually so high, though I have known it reach 105° when the disease has been limited to the bronchi alone, and the pulmonary tissue has escaped. The rhonchi of pneumonia are more sonorous and scanty, and the moist crepitation is not so loose and bubbling as in bronchitis.

When acute lobar pneumonia attacks the upper lobe of a lung, it is liable to be mistaken for phthisis. The exudation poured out in these cases, and the dulness and tubular breathing, are just the signs which ensue from tubercular deposit. The local indications are often trifling, however, compared to the febrile disturbance and prostration, and time alone may be capable of clearing up the diagnosis. In simple pneumonia the local and general symptoms soon pass off, whilst in tubercular cases they gradually become worse, or merge into the chronic form, when the diagnosis is all the more difficult, if not impossible. Physical signs cannot clear up the difficulty, for both in pneumonia and apex consolidation from tubercle, there is great dulness, bronchophony, and bronchial respiration to indicate that the lung tissue at this part is consolidated. Miliary tubercle may give rise to no signs whatever, and the disease usually creeps on but slowly, with fever and emaciation, cough, and loss of appetite. Tubercle may be present in some other parts of the body, and there may be a history of it in the family.

The diagnosis from pleurisy is given in the chapter devoted to that subject (p. 403).

In those cases of pneumonia which begin with delirium or convulsions, and the tongue soon becomes brown with sordes on the teeth, there may be a doubt for some days whether the condition is not one of typhoid fever. In adults we may often meet with this, but in children it is not so common, and if the pyrexia is moderate and the bowels are quiet, we are tolerably certain of the true state of things.

When delirium is fierce and continuous, or there are convulsions, and there is much headache, the symptoms at an early period of the illness are not unlike approaching meningitis, but in pneumonia from the onset the temperature is higher and continues so, whilst the breathing, which is much accelerated, is not irregular, slow one minute and rapid another, as in meningitis. Again the vomiting of pneumonia, when present, does not last so long, and there is an absence of gastric irritability which is so common in cerebral disease. The tongue, though at first may be loaded with a creamy fur, soon becomes vividly red in pneumonia, the pulse is more frequent, the heat of the skin is greater, and the thirst is urgent. In those cases of meningitis complicated with pneumonia, broncho-pneumonia, pericarditis, &c., great difficulties present themselves in arriving at a correct diagnosis, till the character of one or the other disease predominates.*

Croupous pneumonia differs from *catarrhal pneumonia* in the greater dyspnœa of the latter affection, the duskiness of the lips, and the pallid and bloated countenance. There is more restlessness and anxiety; the cough is loose and choking, and muco-purulent phlegm is often dislodged from the air passages by a paroxysm of suffocative cough or vomiting. When the child is too young or feeble to expectorate, the sounds over the affected tubes are loose and extensive. The symptoms in this variety come on earlier, and the vital prostration is more marked.

Pneumonia may be distinguished from *œdema of the lungs* by the dulness on percussion and the tubular breathing, whilst in the latter affection the sputa are frothy and thin, and the complaint occurs as the consequence of long-continued congestion from heart or kidney disease.

Treatment of croupous pneumonia.—In the acute congestive stage, if the child is strong enough, and there is much pain in the side, the application of a few leeches, or even venesection may be necessary. Three or four leeches applied to the affected side will sometimes quickly relieve the pain, and embarrassed breathing, causing the blood to circulate more freely through the lungs, reducing the temperature and lessening the violence of the heart's action. This treatment must be resorted to early in the disease, and it is of the greatest importance to be very cautious in the selection of the cases. These will almost invariably be found in country practice, and seldom in large towns and cities. No doubt children have been so saved when other remedies have failed, and the plan is one to be held in mind as it frequently saves the lung from organic change, and preserves life. Every case, however, must be treated on its own merits. If suitable diet and rest are observed the patient may be left to nature in many cases. M. Barthez was a warm advocate for the expectant treatment of pneumonia in early life. In a paper he communicated to the Academy of Medicine of Paris in 1862, he states that of 212 cases of lobar pneumonia, occurring between two and fifteen years of age, two only terminated fatally, although an approach to active treatment was not adopted in more than a sixth of the number.* He was strongly opposed to the repeated abstraction of blood, or any active measures as tending to produce weakness and to protract convalescence.

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* Vide Chap. VI, "On Typhoid Fever," and Chap. XLI, "On Diseases of the Brain."

Tartarated antimony is a most useful drug, and in strong children it may be given advantageously for a short time in small doses as gr. $\frac{1}{12}$th to $\frac{1}{6}$th, with the solution of acetate of ammonia, or the dilute hydrocyanic acid (Form. 60). The antimony acts best when it does not provoke vomiting, but simply determines to the skin and lowers vascular action. Valuable as antimony undoubtedly is, it must be used with great caution, and watched very carefully, for in young children it soon causes depression and faintness, and if the occurrence of these symptoms is not guarded against, the local signs increase instead of improving. This again, like bleeding, is only suitable for strong children in the early stage of the disease, and not for those who have been reared in the contaminated atmosphere of large towns. A few drops of antimonial wine, with citrate of potash and the solution of acetate of ammonia, or spirit of nitrous ether, will keep up a gentle action of the skin and bring relief. Saline diaphoretics and diuretics at the outset followed by expectorants find much favour.[*] Emetics are not indicated in this form of pneumonia.

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* West, op. cit., p. 373.

When the temperature ranges from 103·0° to 104·0°, and great restlessness and delirium are present, the cold bath is an admirable remedy, and I should never hesitate to use it under such circumstances. There is no other remedy that so effectually and rapidly brings down the body-heat and calms the excitement. I have recorded the case of a boy, thirteen years of age, who was put into a bath at 90°, which was gradually cooled down to 70° by adding lumps of ice. The body-temperature at this time was 104·2°, pulse 140, respirations 56, and he was nearly unconscious. On coming out of the bath after seven minutes' immersion, the temperature fell to 100·6°, and for two hours he lay tranquil. Four hours afterwards the temperature rose to 104°, and on the bath being repeated for eight minutes, the temperature fell to 100·6°. The highest temperature reached was 104·8°. Fourteen baths were taken in the space of forty-three hours. They never failed to reduce the temperature, to mitigate excitement and delirium, and to promote sleep.[†]

With the tendency to exudation of lymph mercury may be employed, but more sparingly in this than in some other parenchymatous inflammations. When the constitution will bear it, its action as an antiphlogistic may shorten the stage of exudation, and promote and hasten the absorption of the newly effused lymph before it has had time to become organised, and to act as an irritant to the surrounding healthy textures. Small doses of calomel with a few grains of James' powder may be sometimes given with advantage (Form. 62).

Tincture of aconite, in minim doses, is also useful from its power in promoting diaphoresis. The antiphlogistic effects of aconite are very marked in relieving tension of the pulse, and lowering arterial pressure, but this drug tends to reduce the respiratory movements as well as the temperature, and acts as a sedative on the cardiac circulation. I have never observed any bad effects follow its administration in acute pyrexia in small and repeated doses, but great benefit where the vascular excitement has been considerable, and the skin pungently hot.[‡]

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[*] 'The Collective Investigation Record,' July, 1883, "On Acute Pneumonia," p. 107.

[†] "Case of Croupous Pneumonia Treated Successfully by the Cold Bath," 'Brit. Med. Journ.,' 1883, vol. ii, p. 725.

[‡] See the action of Aconite in Chap. IX, "On Scarlet Fever" p. 91.

When the physical signs announce that the lung is freely secreting, and sthenic action is reduced, a grain or two of the carbonate of ammonia may be given, particularly if the pulse is weak or unsteady, and there are signs of collapse, when it may be safely combined with decoction of oak bark, or senega. Whilst the sputa are viscid and the urine is turbid, alkalies are indispensable.

A few grains of hydrate of chloral may be of service where depression is to be apprehended from the want of sleep, but we should bear in mind that it lessens the activity of the respiratory centre and enfeebles the vaso-motor system—a state of things we are most anxious to guard against. Its action is also very manifest on the circulation, lowering and weakening the action of the heart, by paralysing its sympathetic ganglia. The combination of belladonna tends to obviate this. Chloral should not be administered when the pulmonary circulation is much involved, for fear of increasing relaxation in the vessels and further enfeebling the action of the heart.

Bromide of potassium is a safer remedy. It has a sedative influence on the nervous system, and induces sleep, without depressing the heart's action.

In the shape of local applications, nothing equals a jacket poultice of linseed meal. It should be applied over the whole of the affected lung, as hot as can be borne, and changed once in two or three hours. Generally speaking poultices are not made large enough to envelop the diseased organ ; the object aimed at is, not only to relieve pain, but to draw the blood to the surface, and so to act as a sedative on the inflamed or congested parts beneath. The chest walls of children are thin, and hence the value of poultices in lung affections is far greater than in the like diseases of adults. When moderately and cautiously used a turpentine stupe is very serviceable. A piece of thick household flannel should be folded the required size, then wrung out of hot water and a few drops of turpentine sprinkled over it. This should be laid over the affected part of the lung, and covered with a piece of oiled silk, or a dry fold of linen rag, and kept on for twenty minutes. When it is removed the skin will be found of a bright erythematous hue, and the cutaneous vessels will remain dilated for a considerable time. A layer of cotton-wool should now be applied to the chest.

The diet should be light, and at first without stimulants. In all cases, milk, beef tea, and cooling drinks from the onset should be given freely. After about five days or a week, when the temperature falls (perhaps with crisis of diarrhœa or sweating), wine, eggs, and additional nourishment are needed. The temperature of the room should be about 60° and well ventilated; the head raised, and the position changed frequently.

In the treatment of the second stage, or that of hepatisation, a flying blister or the application of iodine may be needed, but this will be more fully alluded to when we come to speak of the disease in its chronic form. The perchloride of mercury in small doses, iodide of potassium, and cinchona, are valuable remedies in their turn. The ammonio-citrate of iron, or the syrup of the iodide, are both useful remedies, particularly if the child is anæmic.

In the third stage, carbonate of ammonia, brandy, quinine, and the mineral acids may be required, followed by cod-liver oil and change of air.

2. *Catarrhal pneumonia* (*acute lobular pneumonia, epithelial pneumonia, broncho-pneumonia*).—This variety is quite distinct from croupous pneumonia in its symptoms, pathology, and its tendency to a fatal termination. The disease attacks both lungs, though one lung may be more involved than the other, and by retarding the circulation through a portion of it, leads to its consolidation. It is a combination of bronchitis and pneumonia, the one affection gliding into the other, thus rendering it difficult to say which predominates. Catarrhal pneumonia is a frequent outcome of bronchitis, indeed the two conditions constantly occur together, but they must be recognised as separate and distinct diseases, having a different clinical and pathological importance. The younger the child the greater is the frequency of catarrhal pneumonia; after the age of six the croupous form is most frequent.

Causes.—The same causes which bring about bronchitis are capable of producing catarrhal pneumonia in children. The inflammation extends from the larger to the smaller bronchi, and finally fixes on the air vesicles. Cold and changes of weather appear to be the most common causes. It is frequent in rickety and strumous subjects, during, or soon after, whooping-cough and measles, and it occurs as a secondary affection in diphtheria. Moreover it may originate in debility from whatever cause, and from deficient food, an impure atmosphere, and the inhalation of dust. Any exhausting illness which has obliged the child to maintain a recumbent posture for a length of time, is capable of originating this mixed disorder. Children who are delicate from birth are very subject to it, if they get bronchitis, and the same applies to cases of wasting and marasmus.

Symptoms.—The disease generally begins with catarrh, and gradually develops itself, but sometimes it is more sudden in its onset, if the child is cutting teeth, or is delicate. The case may be one of simple bronchitis for some days, and then all the symptoms become aggravated from the extension of inflammation to the air tubes. At an early period of this affection, the dyspnœa is well marked, and the *alæ nasi* are active. The face presents a livid hue, whilst the lips soon become bluish, and the skin breaks out into a profuse perspiration, notwithstanding the fever is high. The temperature may reach 104° or 105°, but it is not long maintained at this height, and undergoes considerable variation. The pulse is very frequent; in a little child under my care, some years ago, it reached 200 per minute, and 150 is by no means rare; it is small, feeble, and collapsing, for the venous system is as full as the arterial is empty, and the pulmonary circulation is obstructed. The respirations are hurried and laborious, sometimes as many as 60 or 100 per minute. The cough is hacking and short, similar to that of pneumonia, and not paroxysmal as it is in bronchitis. The violence of the cough often induces vomiting which brings temporary relief by dislodging phlegm, and enabling the child to get snatches of sleep. The bowels are often loose and offensive.

On a *physical* examination, the signs of bronchitis are manifest, large and loose crepitations are heard, and this is succeeded in a day or two by tubular breathing, harsh and dry. Although at first diminished resonance may be limited to scattered nodules and bronchial breathing is to be heard with fine crepitant rhonchus, the dulness gradually creeps upwards to the spine of the scapula, and the lung becomes dull throughout.

As the complaint steals on, the child appears torpid and indifferent, and refuses to take any nourishment. The expression is painfully anxious, the eyeballs are staring, and at intervals concealed beneath the upper eyelids. The face is very pallid, whilst the lips are dusky, and the hands and feet are cold and purple. The respirations are laboured and noisy, and cough is no longer excited owing to the increase of exhaustion. In this condition the child may die in a convulsion, or pass into coma and sink.

In cases that recover, the pyrexia gradually diminishes, and the general symptoms improve. The face assumes a more natural appearance, and the pulse and respirations fall in frequency; the tongue becomes clean and the child is inclined to take food. Notwithstanding these favorable symptoms, the lung is slow to resume its normal condition, and it is a long time before the dulness disappears and the exudation thrown out is completely absorbed. Indeed many weeks may elapse before recovery is established. The disease is liable to return if the child falls into delicate health, or catches cold.

Pathology.—In this variety distinct and separate pulmonary lobules are affected. These are surrounded by the interlobular septa, and separated by crepitant lung tissue. The inflammation extends along the smaller bronchial tubes to the air vesicles, or it originates in collapsed lobules. It is in short a frequent consequence of the air tubes being obstructed by bronchitis, and hence the collapsed portions of lung are especially prone to catarrhal inflammation. The lung becomes solidified in patches. On section the lobules are smooth, firm and red, and give exit to a bloody discharge. When a lobule is emptied of air, and more or less of the bronchial contents escape into the alveoli by forced inspiratory action, the lobule passes into a state of congestion, and then of hepatisation. In the earlier period of the consolidation, the alveoli are stuffed with cells and the epithelium occasionally undergoes fatty change.

In the next stage the collapsed and inflamed lobules coalesce into larger masses which frequently end in consolidation of large portions of the lung.* Lobular pneumonia now becomes lobar pneumonia. Unlike the croupous form of pneumonia we have already considered there is no fibrinous exudation, but a cell proliferation which distends the alveoli at the termination of the smallest bronchi. These cells are derived from the epithelial lining of the alveoli where they remain, and as they cannot be readily discharged by expectoration, they accumulate, cause local irritation and form into masses, which undergo retrogressive changes. Hence the inflammation may lead to abscesses in the lungs or to caseous degeneration (*scrofulous pneumonia*), or to tuberculosis, in unhealthy children and that terribly acute form of phthisis known as "*galloping consumption.*" In some protracted cases the disease may terminate in chronic pneumonia, or in fibroid change.

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* Lettsomian Lectures—"On the Diagnosis and Management of Lung Diseases in Children," by George Buchanan, M.D., F.R.C.P., 'The Lancet,' 1868, vol. i, p. 215.

Treatment.—In this variety lowering measures must be discarded. Ipecacuanha wine in a saline mixture, and carbonate of ammonia, senega, and tolu are the remedies to be depended upon (Form. 61, 65, 66). When there is an accumulation of phlegm in the air tubes an emetic to dislodge it will relieve the breathing and ensure rest. Some of the best effects have followed the use of mild emetics at the beginning of the complaint, where the bronchial tubes are loaded with mucus. I have not observed any bad effects follow the use of a teaspoonful of ipecacuanha wine, followed by a little warm water, till vomiting ensues, unless the child is very exhausted. Generally one or two doses will be enough, but if the child is prostrate, and there is lividity of the face and mucous membranes, with a feeble pulse and shallow respiration, the ipecacuanha failing to excite cough or vomiting will increase the general distress. The bronchial tubes are loaded with phlegm and mucus, and the general discomfort and pain in the chest cannot be relieved so long as they remain. In these cases it may be well to combine the ipecacuanha with a stimulant like the carbonate of ammonia, or a few grains of sulphate of zinc, and if its action is delayed, to tickle the fauces with a feather, but even these attempts sometimes fail, and then our only chance is to place the child in as upright a position as possible in bed and support the failing circulation by ammonia, spirit of chloroform, wine, and beef tea. When an emetic acts efficiently it excites the action of the respiratory muscles, empties the larger tubes of their tough or fluid contents, and stimulates the smaller bronchi to renewed secretion and activity. The dry sounds and hyperæmia of the mucous membrane diminish and give place to moist crepitation, and resonance on percussion. The expression changes and becomes animated, the duskiness of surface passing off as the blood is better aerated, and the child is restored by refreshing sleep.

The carbonate of ammonia is an excellent remedy by loosening the contents of the bronchi, and favouring expectoration. I have many times known children expectorate or bring up phlegm by coughing, just in proportion as they have taken the remedy or not. When the pulse is weak and quick, I have seen excellent effects from combining the ammonia with quinine and senega.* This encourages expectoration and improves the pulse and appetite.

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* See footnote * next page.

If the tongue is furred, and the sputa are thick and tenacious, the ammonia may be given with bicarbonate of potash and ipecacuanha.† When there is no tendency to accumulation in the bronchi, and the cough is irritating and the child restless, a few drops of the compound tincture of camphor, or henbane, may be safely added.

When the temperature remains persistently high, and there is much excitement, the child may be put into a bath, and the same precautions observed as previously described (p. 430). I have found the salicylate of soda very effectual in reducing the pyrexia (Form. 90).

The strength requires to be well supported. The diet should consist of strong beef tea, and chicken or veal broth. The egg and brandy mixture is often necessary, or a few drops of brandy given with milk as often as may seem necessary. When exhaustion threatens, recovery is often due to the rallying effect of stimulants. In feeble children of only a year old I have sometimes given a little champagne in potash water with excellent results.

As regards local applications, warm linseed poultices, with or without mustard, as we have mentioned under lobar pneumonia, will be of most benefit. The chest should afterwards be covered with cotton wool.

Later on, the preparations of iron—the syrup of the iodide, the syrup of the phosphate (syrup. ferri phosp., B.P.), the chemical food (syrup. ferri phosp. comp.), or the vinum ferri, will be necessary to strengthen the system and improve the quality of the blood. During convalescence, cod-liver oil or Squire's malt extract will be found serviceable, or they may be combined with great advantage. The latter remedy may be given in milk.

Epidemic pneumonia.—Some observers look upon pneumonia as a zymotic disease, that under certain circumstances it becomes epidemic, and when epidemic it may become infectious.‡ Cases have been described in which no satisfactory explanation of the outbreak could be given, the water supply and all the local conditions being excellent. The epidemic related by Dr Gooch, of Eton, occurred at a school-boarding house; sewer gas escaped through a defective trap in the butler's pantry, and found its way into the boys' rooms. This was held to be the cause, as there was no epidemic of scarlet fever or any other illness in the neighbourhood at the time.*

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* Form. 69:
℞ Amm. Carb. gr. viij
Tinct. Quiniæ ʒiij
Spt. Chloroform. ♏xx
Syr. Tolut. ʒiij
Decoct. Senegæ ad ℥iv. M.
A tablespoonful every four hours.

† Form. 70:
℞ Amm. Carb. gr. vij
Potass. Bicarb. ℈ij
Vin. Ipecac. ♏xl
Syr. Tolut. ʒiij
Aquam ad ℥iv. M.
A tablespoonful every four hours.

For children five or six years old.

‡ 'The Collective Investigation Record,' July, 1884, p. 117.

The pythogenic origin of pneumonia seems to be indisputable, and the phenomena of the fever may be present without any implication of the lung tissue.†

3. *Chronic lobular pneumonia.*—This is a disease of great interest and importance from its liability to be mistaken for tuberculosis or chronic phthisis. The connective tissue between the lobules is affected, leading to induration and consolidation of the pulmonary tissue. It generally follows bronchitis, pneumonia, measles, or diphtheria, or, what is far more common, it creeps on insidiously in bad states of health, and may prove persistent and troublesome. I have met with it in feeble children of rickety constitution, and for weeks together could not decide whether the disease was tubercular or not. In fact, until a case of this form of pneumonia has been for some time under observation, it is impossible to come to a decision. When we are sure that a child has enjoyed good health till an attack of bronchitis or whooping-cough has happened, and the complaint passes into localised dulness, below one clavicle or scapula, we are generally correct in assuming that it is of simple origin. The two following cases exemplify this condition.

Chronic lobular pneumonia, simulating tuberculosis; recovery.

CASE 1.—V. B—, æt. 9½, was admitted into the Samaritan Hospital, under my care, on March 25th, 1875. He was a pale, thin, emaciated boy, with light hair and grey eyes, and had been ailing in health, more or less, for five years. There was no history of an acute attack. Had had both whooping-cough and measles. His mother dated his delicacy to an attack of quinsy three years previously.

On examination there was a general flattening of the thorax below the clavicles, especially on the left side, to the inner aspect of the corresponding nipple, and this was in a great measure due to imperfect development of the left half of the thorax. He could take a full inspiration, at the termination of which was a cooing, dry, bronchial sound, not heard on the right side. The percussion note was good in front, but nowhere clear behind; the breathing was harsh and irregular, and there was distinct bronchophony, but no moist sound. The pulse was variable, the least fatigue or excitement at once accelerating it; one day it would be as low as 72, and another as high as 112. The respirations were tranquil, and did not exceed 20 per minute. Morning and evening temperature 99·2°. He was ordered a diet of milk, eggs, and beef tea; a mixture of hydrochloric acid and quinine; diluted tincture of iodine (one in four) to be painted under the left collar-bone night and morning.

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* Ibid., July, 1883, p. 106.

† Ibid., p. 70.

In May he was much better, and in June he had gained in flesh, and his general health was most satisfactory. Temperature normal; pulse 72, respirations 20. The physical signs still indicated some remaining dulness and bronchophony between the scapulæ. He was discharged well on June 23rd.

Readmitted Feb. 17th, 1876.—Some time after leaving the hospital he seemed to be in perfect health, but latterly he had lost much flesh and strength. The wasting was most apparent about the temples, the arms and legs, the shrunken hands, and the sternal and scapular regions. He looked like a child in the last stage of phthisis. The chest was clear on percussion, and expansion was everywhere good, the inspiration was rather short and harsh, but there was no dulness, and the vocal vibration was slight. As the expiratory note was not caught at all, its suppression was probably due to nervousness. In the right supra-scapular space, inspiration was short and rather harsh. Immediately below the spine of the scapula, small crepitant rhonchus was most distinct, which disappeared between the inner border of the scapula and the spine; over the middle lobe of the lung there were coarse, loose, and moist bubbling rhonchi (suspected softening of middle lobe), and dulness was very marked from this point downwards. There was no bronchophony, the complete absence of which I could not explain, but on inspiration the air seemed to be entering some small cavity, the thin sternal walls only intervening between it and the ear, when applied to the chest. In the middle and lower lobes of the right side there was heard crepitant rhonchus, precisely resembling the small crepitant rhonchus of pneumonia; over this the percussion note was resonant. The urine was turbid, slightly alkaline, and rather high-coloured, with a sp. gr. 1024; on boiling, flakes like albumen floated freely in the specimen, which immediately disappeared with effervescence (phosphates) on the addition of nitric acid. The pulse was 96, and of good calibre; the respirations 20; the morning temperature was 99·4°, the evening 100°. The variation in breathing was very noticeable here—one minute only breathing twenty times and another as many as twelve times in the quarter of a minute, just as we see in some cases of tubercular meningitis, and gradual death from exhaustion.* He was never flushed, and there was no sweating. He was ordered quinine, phosphoric acid, and cod-liver oil.

22nd.—The urine was unchanged—he was ordered port wine.

24th.—There was more loose crackling in the lung, which appeared to be breaking down, as gurgling and pectoriloquy were distinct, and when he whispered the sound travelled up the stethoscope distinctly.

March 9th.—During the last few days no bronchophony or gurgling was to be heard.

24th.—He had gained flesh and looked better, and although his appetite was good his cough was still troublesome. The change in the physical signs of the lung was very remarkable, the note was clear throughout the surface of the right lung, there was no trace of bronchophony or moist sound of any kind, except a little dry crackle; all the characteristic signs of breaking-down of lung texture on the 24th ult. had disappeared. The only sound now was prolonged expiration and diminished expansion on this side. It is possible that the cause of this was due to some "*lobular pneumonia*" of a chronic character pressing on the tubes, and that consolidation of lung tissue was set up.

April 21st.—The only change now detectable was that the respiratory murmur was weaker over the affected side than the left, every trace of crackling and consolidation having disappeared. He was ordered the ammonio-citrate of iron in five-grain doses twice a day, and to leave the hospital. A year later (April, 1877) he was in perfect health.

Case 2.—This case presented considerable interest, and when sent to me an abscess communicated with the left lung and pleura.

B. M.—, æt. 3, a fair and very intelligent child, was admitted into the Samaritan Hospital, under my care, on December 22nd, 1876. The mother stated that the child had been ailing with bronchitis and cough ever since the previous September, and had not enjoyed a day's health since. There was no history of an acute illness; on the other hand the symptoms were gradual, and at no time marked by fever or inability to leave her bed. On examination there was a prominent and circumscribed swelling on the left side, over the lower ribs, about two inches below the nipple. There was considerable dulness and imperfect expansion below the left clavicle; the voice was bronchophonic, and the respiration harsh and bronchial. The heart's sounds were distinctly heard throughout the thorax. Posteriorly the dulness extended downwards to the middle of the scapula, and the note was not at all clear below this. There was scarcely any cough, and the temperature was normal; pulse 160, small and weak; respirations 56, short and catching; bowels regular; urine free and clear. A poultice was ordered to the swelling, and a grain of carbonate of ammonia in tincture of cinchona every four hours.* The diet consisted of beef tea, milk, and two eggs daily, beaten up with sherry. On the 24th the abscess was opened and a small quantity of laudable pus escaped; the child had slept tranquilly without cough, but the pulse was very weak and small. On the 26th the temperature was 98°, pulse 128, resp. 48. The abscess had discharged a large quantity of matter in the night, and this had given her ease; she sat up in bed and was aware of all that went on around her, but she was peevish and fretful, and looked very pallid and exhausted. The upper third of the left lung was very dull posteriorly, and the breathing dry, shrill, and tubular; but descending downwards, these physical signs became less marked, though everywhere they presented a striking contrast to the opposite side. On the 28th the pulse was 96, resp. 32; the abscess was discharging freely and there was no cough; over the lower lobe on the left side the percussion note was becoming resonant, and the dry breathing was supplanted by coarse crackling respiration. On January 4th, 1877, the respiration was clearer under the left clavicle, but still showed a marked contrast to the opposite side; posteriorly the dulness was diminished, and in the lower half of the lung the moist râles were nearly absent, whilst in the centre of the lung the voice was bronchophonic. A mixture of iron, carbonate of ammonia, and a very small dose of iodide of potassium was ordered three times a day.[*] On the 19th the abscess re-formed and it was necessary to make a counter-opening. On March 2nd the patient had gained a stone in weight since admission under the effect of good diet, cod-liver oil, and the syrup of iodide of iron. The patient shortly after sickened for measles, and was consequently detained in hospital till April 13th, when the wound had soundly cicatrised, and no difference could be discovered in the physical signs of either lung, which presented every sign of health.

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* See Chap. XLI, "On Diseases of the Brain."

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* Form. 71:

℞. Tinct. Cinch. Co. ʒiiss
Amm. Carb. gr. viij
Tinct. Camph. Co. ♏xl
Syr. Tolut. ʒiij
Aquam ad ℥iv. M.

A dessert-spoonful every four hours.

For children five or six years old.

Chronic pneumonia appears to be sometimes caused by disease of the tracheal and bronchial glands. Dr Gee has related some interesting cases.[†] Measles, scarlet fever, pertussis and chronic cough were the causes of the glandular affection. In one case (aged 3 years 9 months) a cavity in the bronchial glands was found, containing a slough, which opened into the œsophagus and left bronchus; the tracheal glands were enlarged and caseous; the right lung was studded with miliary tubercles. In a second case (aged 6 years) the bronchial glands at the bifurcation of the trachea were transformed into a cheesy mass; the right bronchus was perforated by an ulcer. There was hectic fever during illness. In a third case (9 years old) at the bifurcation of the trachea there was a sloughing cavity, and the right bronchus opened into it; the right lung was entirely solidified; there was hectic fever throughout the illness. In a fourth case (aged 2½ years) the tracheal glands compressed the lung, and on section the tumour contained a cavity, the size of a walnut filled with thick creamy pus. The bronchial glands were also enlarged.

Œdema of the lungs, though rare in children, is of sufficient importance and frequency to deserve careful consideration. There is no evidence of inflammation in the tissue of the lungs, but it is infiltrated with watery fluid, so that it is firm and inelastic; it contains very little air, scarcely crepitates, and sinks in water. On examination of the lungs after death there may be found an effusion of clear serum into the cavity of the pleura, or even a thin layer of lymph, proving that some degree of inflammation has taken place. The lungs are of a deep red colour. On cutting into their substance reddish serum exudes; and as it escapes the pulmonary tissue becomes crepitant and lighter in colour. The air cells and pulmonary connective tissue contain so much fluid that it interferes with the free entrance of air, and explains the cause of the rapid and difficult respiration. Wilks and Moxon say this is a condition frequently found in Bright's disease, or where there is a disposition to dropsy; the lung is found filling the chest and heavy. On section a quantity of serum drains out, leaving the tissue healthy and firm. It is thus distinguished from the first stage of inflammation, in which the texture is very lacerable.*

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[*] Form. 72:
℞ Ferri et Amm. Citr. gr. xij
Amm. Carb. gr. viij
Potass. Iodidi gr. iv
Syrupi ʒij
Aquam ad ℥iv. M.
A dessert-spoonful to be taken three times a day.
For children five or six years old.

[†] "On the Chronic Pneumonia which attends Disease of the Tracheal and Bronchial Glands," 'St. Barth. Hosp. Rep.,' vol. xiii, p. 63.

Causes.—We may attribute this peculiar state in most cases to a passive or mechanical obstacle to the free circulation of the blood, as in pneumonia, valvular disease of the heart, and pressure on the pulmonary veins. Laennec believed that pulmonary œdema may occur as a primary and idiopathic condition, and that the suffocative orthopnœa, which sometimes destroys children after measles, arises from such œdema.† Cases have resulted from anasarca after scarlatina, from morbid states of the blood, as in Bright's disease, purpura, and the continued fevers. I have seen two cases which occurred as the consequence of constitutional debility, and a low state of the general health. Both were preceded by slight catarrh (a subacute form of bronchitis), and no alarm was realised till the respiration became rapid, out of all proportion to the pulmonary state. The condition is one not only associated with debility, and relaxation of the vessels and tissues, but the quality of the blood has probably undergone a change similar to what occurs in passive dropsy. The blood is thinner and more watery than in health, the corpuscles and organic matters are diminished, and hence the transudation of the serous parts through the vessels and capillaries.

The *physical* signs which indicate this condition are not very characteristic or reliable; there is some dulness on percussion, and increase of vocal fremitus; the respiration is weak and often mixed with rather loose râles and subcrepitant rhonchus; "the fine bubbling rhonchus, when very liquid and well marked, is the most characteristic sign."*

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* 'Pathological Anatomy,' 1875, p. 323.

† 'Diseases of the Lungs and Heart,' by W. H. Walshe, M.D., 1854, p. 448.

Treatment.—This will depend upon the cause. If the disease comes on during the anasarca of scarlet fever, the hot-air bath, and diaphoretics to act on the skin will be needed to remove renal congestion. Small doses of tartarated antimony and spirit of nitrous ether will relieve the dyspnœa, whilst a poultice may be necessary if the bronchial congestion is sufficient to demand it. But it often happens that œdema of the lungs, coming on gradually in strumous and delicate children, demands a supporting line of treatment, as spirit of chloroform, ammonia, brandy, and good nourishment.

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* Walshe, op. cit., p. 449.

CHAPTER XXXVIII

ON TUBERCULOSIS

NATURE AND DEFINITION OF TUBERCULOSIS.—KOCH'S DISCOVERY OF THE TUBERCLE BACILLUS.—ARTIFICIAL PRODUCTION OF TUBERCLE.—GREY AND YELLOW VARIETIES.—ANATOMICAL CHARACTERS AND APPEARANCES FOUND IN THE LUNGS IN TUBERCULOSIS.—COMPARATIVE FREQUENCY OF TUBERCLE IN THE VARIOUS ORGANS OF THE BODY.—USUAL PROGRESS OF TUBERCULOSIS.—CAUSES—*Hereditary predisposition—Influence of age—External causes, as bad air and ventilation—Insufficient food—Chronic diarrhœa and indigestion—The eruptive fevers and whooping-cough—Inflammation an exciting cause of tuberculosis.*—SYMPTOMS—*Pain in epigastrium and indigestion—Temperature of the body in tuberculosis the surest means of diagnosis in the absence of physical signs—Sweating—Pulse—Respiration—Diagnosis—Illustrative cases—Prognosis—Treatment.*

BY the term tuberculosis we mean a general condition of ill health, attended with the deposition of tubercle in one or more organs of the body. It is a constitutional febrile affection which is usually associated with inflammatory action in the lungs, bronchial glands, cerebral meninges, and peritoneum. We say *associated*, because its precise relation to inflammation, whether as a mere variety or as a concomitant, or as a result, is still a great pathological question, which we will discuss further on. In childhood it has some special and characteristic symptoms which we do not observe in later life, and the causes and history have a separate and distinct character. In well-marked cases of tuberculosis the children are usually good looking, with prominent veins, long eye-lashes, and dilated pupils; the figure is erect and slim, the joints are small and slender, and the shafts of the bone thin and straight; the growth of mind and body is active, and the nervous system is highly impressible; the child is sensitive to reproof or kindness, quick and clever at lessons, and does not exhibit the backwardness which belongs to the phlegmatic temperament. These children are not subject to enlargement of the lymphatic glands, nor have they the thick lips and dull expression of the truly scrofulous diathesis. Tuberculosis, then, or the tuberculous cachexia, signifies that state of the constitution which arises from the presence of tubercles; and by tubercles is meant a species of new matter, or growth, prone to degeneration and decay. In its crude condition it resembles concrete albumen, and consequently becomes soft and friable, and acquires the consistence and appearance of thick cream, or cheese, or pus. But a variety of circumstances will determine the character of the exudation, and it may abound in elements at one time which are not to be detected in it at another. It is deposited upon the surface of the mucous membrane of the air cells, or within the parenchymatous structure of the lungs, where, instead of being absorbed or excreted, as happens in the simple exudative inflammations of the healthy, it slowly degenerates by reason of its inherent faulty composition and deficient vitality. This question is discussed further on. Tubercles are the local expression of a depraved constitutional state, and most likely represent enfeebled nutritive energy. When few in number they occasionally become hard and indurated, and do not interfere with the organic functions; but when they are numerous they affect the general health, and if deposited in the lungs, cause in most instances an alteration in the physical signs, and lead to softening and suppuration of the tissues in which they are deposited. The grey and yellow varieties are the kinds with which we are familiar. Under the microscope a section of a miliary or recent tubercle shows numerous leucocytes generally included in a network of delicate fibres—the "*adenoid tissue*" seen in glands. In the centre of the tubercle are large multinucleated cells (*epithelioid*) sometimes traceable into "*giant cells*," the processes of which are directly continuous with the reticulum. The caseous tubercle shows cells in all stages of degeneration and disintegration.

Tubercular exudation is most commonly met with in children and young adults. It occurs in the lymphatic glands, the lungs, and serous membranes, and its progress is generally slow and insidious; but, on the other hand, it is sometimes rapidly roused from latency into activity, or set up anew by some common-place disorder. There is no attempt at absorption or perfect cell formation, but a tendency to ulceration and disintegration, with a certain train of general symptoms, recognised by failing health and strength, and persistent derangement of the digestive functions.

According to Virchow, although tubercle is the result of the death of healthy or diseased tissues, the local process—tuberculosis—also results in the exudation of a material during tuberculous inflammation; such material undergoing a kind of organisation, succeeded by its death, and by its breaking and shrivelling up into a tubercle. This gradual change is termed tuberculisation.* There is much evidence to be adduced in support of that theory which classifies tubercle as a primary formation, like cancer and epithelial and melanotic growths. All the changes that take place are secondary, and without the presence of malnutrition it seems highly probable that no lesion can produce it.†

It is chiefly with regard to tuberculosis and phthisis that the influence of micro-organisms in producing disease is important. Koch, Watson Cheyne, and others, have apparently proved by experiment, that the injection of tuberculous matter into rabbits produces acute miliary tuberculosis, and that the infection is due to a special bacillus contained in the tuberculous material. This identical species is found in the sputum of phthisical patients, and the discoverer regards it as the constant associate of tubercle and containing its actual virus. This important discovery was first made known to us by Koch, of Berlin, in March, 1882, who discovered this organism—a rod-shaped bacterium, now universally recognised as the bacillus of tubercle. The careful observation of men engaged in the scientific investigation of disease, unite in the opinion, that this bacillus is found wherever there is tubercle, and many of them agree with Koch that it is the cause of tubercle. Already the subject is being pursued with great activity, and in all probability the time is not far distant when it will be definitely settled. It is impossible to overrate the value of a discovery which, if completely established, will enable us to draw some important practical conclusions, and among them the question of the communicability of phthisis from one person to another. Buhl, Cohnheim, and others long entertained the view that tuberculosis was infective, and Drs Burdon-Sanderson, and Wilson Fox, showed, that rabbits, and some of the lower animals were prone to the disease when inoculated with tubercle. It is a great question, and if

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* 'Dictionary of Medical Sciences' (Dunglison), Article "Tubercle," 1874, p. 1062.

† 'Jones and Sieveking's Pathological Anatomy,' by Payne 1875, p. 203.

Koch's discovery be verified by subsequent observations, it will prove that this particular organism is the cause of phthisis, and the nature of the disease will be better understood. Moreover, when the physical signs of the disease are doubtful, the presence of the bacillus in the sputum decides the diagnosis. In the more rapid forms of phthisis, the bacillus tuberculosis has been found in great numbers in the caseous products which fill the pulmonary alveoli, and in every case where excavation is present. In two cases of rapid phthisis described by Dr Samuel West, at the Pathological Society,* "bacilli in great groups and masses" were obtained from the cavities, but in one case no bacilli were found in the lung tissue, only in the lining of the cavities. In fibroid phthisis the bacilli are found to be far less abundant. Sir Andrew Clark in eleven cases of fibroid lung with ulceration could not find the bacilli in the expectoration or the tissues or cavities.†

Dr Wilson Fox thinks it questionable whether the bacilli can produce and propagate the disease ('Brit. Med. Jour.,' Jan. 17, 1885), and Sir Andrew Clark is of opinion, as are many others, that all the phenomena of phthisis are not to be accounted for by the tubercle bacillus, the theory being at variance with the clinical facts.

Until quite recently pathologists believed that simple mechanical irritation was capable of setting up the same morbid processes as the inoculation of specific products. It seemed satisfactorily demonstrated that general tuberculosis may arise from the inoculation of a morbid poison into a wound, or from the absorption of inflammatory products, but recent investigations seem to show that the subcutaneous injection of non-tubercular matters cannot produce tubercle. It is asserted by many that the "tubercle bacillus" is the infecting agent, and is essential to the production of tubercle. But there is no positive reason to suppose that specific inoculation is really necessary, and in the present stage of the investigations now being so vigorously carried on, the exact way in which infection arises cannot be considered as definitely settled. It seems probable that low forms of simple, or even acute inflammation in some subjects may eventuate in tubercular disease, without any original deposition of tubercle; and in support of this view I may allude to the circumstance that neglected pleuritic effusion in children is often followed by empyema and occasionally by tuberculosis. A common cold in delicate children, or in those predisposed to the affection will now and then give rise to it; indeed, no vascular excitement in such subjects is to be disregarded.

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* The 'Lancet,' Feb. 10th, 1883.

† 'Brit. Med. Journ.,' Dec. 13th, 1884.

Tubercles were considered to be allied to scrofulous lymphatic glands till the time of Bayle, who regarded them as a peculiar product, and the result of a special constitutional diathesis—a deposit depending on a morbid state of the blood. Bayle gave the name of tubercle to the grey and yellow masses which he found in the lungs. Virchow endeavoured to prove that yellow caseous matter was not the character of true tubercle, and that it might arise from fatty degeneration, and the products of pus, cancer, and so forth. He called the grey granulation of Bayle the typical form of tubercle, and considered infiltrated tubercle and caseous masses as the consequence of inflammation. Dr Wilson Fox, and some others, regard all tubercle as histologically alike, whether it be grey or yellow, miliary or scrofulous—that the typical grey granulation is not the only form in which tubercle occurs.* He believes that the caseous products arising in the lung in phthisis are due to the destruction of vessels by a new growth in the walls of the air vesicles, whilst Mr Watson Cheyne is sceptical as to caseation being due to defective blood supply, and thinks it more likely owing to the influence of bacilli.†

Dr Fox's researches seem to show that the changes found in the lungs, in acute tuberculosis in children, are the same as those observed in the ordinary forms of phthisis.

According to this authority‡ the following are the chief appearances found in the lungs of children dying of acute tuberculosis:— "The semi-transparent granulation of Bayle. Opaque white granulations, for the most part soft, but with varying degrees of firmness and difficulty of crushing. Granulations like the semi-transparent granulations of Bayle, and also like the soft granulations, but more or less caseous in their centres. Yellow soft granulations, easily crushed, but not easily removed from the pulmonary tissue, varying in size from that of a poppy seed to a mustard seed, rarely of the size of a hemp seed, and still more rarely of the size of a split pea. Caseous granulations, dry, opaque, and friable; sometimes with, sometimes without, a grey transparent zone of induration surrounding them. Groups of granulations, mostly like the semi-opaque, sometimes entirely opaque, rarely semi-transparent; two or three, or four, or more in number, reaching the size of a split pea, or a bean, or even a small walnut, or hazel nut. Indurated pigmented granulations, singly or in groups like the last described. And lastly, tracts of indefinite extent, one or two or more inches in diameter, irregular in outline, prominent above the surface, granular on section or tearing of the tissue, but passing sometimes insensibly into the so-called grey infiltration. Cavities, from infinitesimal specks to the size of a hazel nut or larger. Granulations softening into cavities—either the softer—the white or the yellow. The semi-transparent granulation in the lung is not, as far as I have seen, found softening into a cavity without some intermediate change. Tracts of grey semi-transparent appearance, known as the 'grey pneumonia' or 'gelatinous pneumonia,' or 'grey infiltration' or gelatinous infiltration of Laennec; spots also of red pneumonia; in some cases œdema; in some cases injection or punctiform extravasation; in some cases emphysema and collapse; in some cases capillary bronchitis and dilatation of bronchi. The point on which I wish especially to insist is, that the grey granulation of Bayle is very seldom found alone. They are sometimes found as isolated structures scattered throughout the whole lung, but this is comparatively rare. In the combinations of eleven cases they were only found alone in two. They either co-existed with caseous, or with the white and the soft, or with the caseous, or with the soft and caseous, or with the indurated, or with the soft, yellow, and caseous, or with the soft and caseous alone; most of these being combined either with red or grey pneumonia, or with tracts of caseous infiltration. Those are the forms of the combinations of which I made notes in eleven cases that died under my own observation. The grey granulation of Bayle, the typical tubercle of Virchow, does not therefore exist alone in the majority of cases of acute tuberculosis in the lungs of children. It is most commonly associated with other granulations, which have a different appearance to the naked eye, and also a different anatomical structure; and the latter, in some cases, are the predominant change, so that in some lungs the grey granulation is comparatively rare."

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* 'Trans. Path. Soc.,' vol. xxiv, p. 287.

† 'Brit. Med. Journ.,' Jan. 17th, 1885, p. 130.

‡ "Discussion on the Anatomical Relations of Pulmonary Phthisis to Tubercle of the Lung," 'Trans. Path. Soc.,' vol. xxiv, p. 291.

Unlike the case of adults, grey granulations and crude miliary granulations frequently exist in children as the only form of tubercular deposit. In the adult, M. Louis discovered miliary tubercles alone in 2 out of 123 cases (1·6 per cent.), and grey granulations alone only in 5 more (4 per cent.). In the child, Rilliet and Barthez found miliary tubercles without grey granulations in 107 cases out of 265 cases, and grey granulations alone in 36 out of the same number of cases. In 102 cases of phthisis in children, Dr West* found miliary tubercles alone in the lungs in 20 instances, and grey granulations alone in 17 more. Another anatomical peculiarity in early life is the great frequency of yellow infiltrated tubercle. It seldom exists alone, but is generally associated with crude yellow tubercle and grey granulations, and sometimes with advanced disease of the bronchial glands. Rilliet and Barthez met with it in 88 out of 265 children, or in 33 per cent. of their cases.

As to the frequency with which we meet with tubercle in the different organs in the body, Steiner found the intestine involved in a third of all his cases; the most frequent seat being the *small* intestine, and the least frequent the *large*. From 302 dissections made in the Prague Hospital by Drs Steiner and Neureulter tubercle was found—

In 1 organ in 42 cases ... In 5 organs in 42 cases.
In 2 organs in 48 „ ... In 6 „ in 28 „
In 3 „ in 62 „ ... In 7 „ in 20 „
In 4 „ in 47 „ ... In 8 „ in 6 „
Five times in nine cases, and twice in ten different organs.

The bronchial glands were affected in 275 cases, the lungs in 175, and the stomach in 4.† In 312 children in whom Rilliet and Barthez found a deposit of tubercle in one or more of the viscera, the lungs were healthy in 47 cases; whilst in 123 similar instances in the adult, Louis only found one such exception.‡

Dr Wilson Fox mentions 61 cases which he examined for the chief purpose of illustrating the pulmonary manifestations of the disease. All were above ten years of age, and only 2 below fifteen and two ages not stated. In all the cases but one the lungs were affected, and in this was a combination of tubercular pleurisy with tubercular peritonitis. In 7 cases the data were uncertain; in 3 cases the disease was limited to the lungs; in 7 cases two organs were affected; in 16 cases three organs; in 12 cases four organs; in 9 cases five organs; in 6 cases six organs; in 1 case seven organs.*

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* Op. cit., 1859, p. 448.
† 'Steiner's Diseases of Children,' 1874, p. 328.
‡ 'Meigs and Pepper's Diseases of Children,' 1874, p. 843.

M. Louis entertained the opinion that when tubercle appeared in any part of the body it was sure to exist in the lungs also, and that the apices of these organs were the selected seat of deposit. We now know that this is by no means the universal law, which the propounder considered he had established, but it holds good with a few exceptions, and is of vast assistance in diagnosis. I have heard it asserted, and I have also seen it in books, that in every case of tubercular meningitis you will find, on examination after death, evidence of tubercle in the lungs, kidneys, peritoneum, or spleen; but twice I have made a post-mortem of this well-developed cerebral affection without finding a trace of the peculiar exudation in any other organ or tissue of the body. Dr Fox mentions a case recorded by Herard and Cornil, in which the disease was limited to a single lung, and he speaks of three other recorded cases where, in addition to other lesions, one lung was affected, and the other remained free.

It was long held that when tubercle was deposited in the lungs it would sooner or later proceed to a fatal issue; but repeated examination goes to prove that it is sometimes spontaneously arrested, and it has been said that this happens in one third of the persons affected with tuberculosis. This is confined to no stage or period of the disease; it may be stopped in the early stages when the deposit is small and trifling, and instances are met with where large cavities have healed and cicatrised.†

Causes.—Of the causes of tuberculosis, and the deposition of tubercles in the lungs, the progress of medical science has not yet enabled us to speak with any degree of certainty; and the same may be said of that variety of disease classified under the comprehensive term scrofula, with its external abscesses and disfiguring ulcerations. It is very difficult to assign the correct value to hereditary transmission from parent to offspring, regarded as a predisposing cause of tuberculosis, because a large proportion of the population is subject to anti-hygienic conditions, which call the disease into existence. The lives of so many young persons are passed in these days of hard toil under such unhealthy conditions that it is readily acquired. What is gleaned from parents respecting their family history is frequently vague and deceptive. Some will tell you that consumption is not known among them, when closer investigation satisfies us that some member of it has suffered from hip-joint disease, open abscesses in the neck, and even fatal affections of the head which must have had a strumous origin. Instances of hereditary transmission are constantly seen in the emaciated frame of the infant whose consumptive mother barely survives the birth. When the child dies, the lungs and other internal organs are so studded with tubercles that little doubt can be entertained that the disease originated at the earliest period of utero-gestation. It may be laid down as a law, having few exceptions, that the union of healthy parents results in the birth of healthy children, and that they grow up to be strong and vigorous; but that when one parent is tuberculous and the other healthy, tuberculosis is apt to show itself in the offspring. As the children one after another reach a certain age they begin to lose flesh and strength and at last die with all the symptoms of pulmonary phthisis, or tubercular disease in some other organ. The best explanation for this large class of cases, which we observe where the victims have been carefully shielded from exhausting or depressing influences, is to be found in a blood dyscrasia, or some changes in the vessels or tissues.

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* 'Trans. Path. Soc.,' 1873, vol. xxiv, p. 375.

† 'Braithwaite's Retrospect,' vol. xlviii, 1863, p. 55.

Youth is one of the most fertile predisposing causes of tuberculosis, the blood in childhood having a great susceptibility to undergo those changes which constitute the peculiar pathological transformation. We can only conjecture what the specific change is; but we do know that in early life the blood is deficient in solid constituents, and in blood-corpuscles. As children grow to maturity, and life advances, the quality of the circulating fluid is enriched, the tendency to tubercular change becomes less and less, and the power of arrest or elimination is acquired if the strength can be maintained. It may be that the diminished number of red corpuscles in chlorosis and anæmia is one reason for the deposit of tubercle and the gradual development of phthisis.

The effect of intermarriages has been well pointed out by Sir William Jenner. "That tuberculosis is transmitted from parent to child is one of the best established facts in medicine. The extreme frequency of tubercular diseases in some circumscribed country districts is, in part at least, explicable by the frequency of intermarriage amongst persons living in such districts; and conversely the exception of particular circumscribed districts from tubercular disease is due to the same cause. In one case, from some special circumstance, tuberculosis has been introduced into the district, and then spread in it from the cause I have mentioned, *i. e.* intermarrying; in the other case, the freedom from the disease of the district, at any given time, is the cause of its continued freedom. Intermarriage of the inhabitants, the disease being absent, prevents its introduction."[*]

Where hereditary transmission is so strong (and that it is so daily experience affords the most conclusive evidence), the germ of the disease either lies in a latent state, or is actively transmitted by the parent. Rilliet and Barthez furnish some interesting facts to the effect that, "of 26 children whose fathers were tuberculous, or probably so, 22 died tuberculous, and 4 non-tuberculous; of 32 children whose mothers died tuberculous, or probably so, 22 died tuberculous, and 10 non-tuberculous; of 6 children whose fathers and mothers died tuberculous, 4 died tuberculous and 2 non-tuberculous. There were 46 cases, or about 1 in 7, in which the hereditary influence more or less prevailed, and 11 in which it was the sole probable cause."[†] There are many points of extreme interest on this part of the subject, such as the relative frequency of its transmission by the two sexes, and the manner in which this takes place.

Children brought up by hand, and weaned too soon, or neglected by the mother, are very liable to tuberculosis. The disease is not common during the first year of life; it is more frequent between the second and third year. Dr Barlow has described a fatal case in a child aged four months[‡] and Steiner alludes to it in sucklings of eight weeks old.[§] A care is related by Meigs and Pepper[||] of a healthy woman, who had several vigorous children whom she had nursed. She gave birth to one which she could not nurse, and this child, after pining for many months, died of tubercular meningitis.

Bad or insufficient food, leading to prolonged indigestion and diarrhœa, exert a powerful influence in the production of tubercle. Artificial foods of all kinds, when too exclusively relied on, may awaken the disease; and defective nutrition and mal-assimilation, however brought about, are common causes of tuberculosis in those who are not even predisposed to the affection. The eruptive fevers and whooping-cough frequently act as a starting-point, the disease having an admitted tendency to spring up after these acute affections. The continuance of febrile action is liable to alter and deteriorate the quality of the blood, and to render the system liable to tubercular deposit. If we recall our experience of the number of children who have exhibited symptoms of tuberculosis, as the consequence of inflammation and febrile disorders, we are in a great measure driven to embrace the doctrine that pneumonia, whooping-cough, and measles not unfrequently originate the disease in constitutions not hereditarily tainted.

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[*] 'Address before the Epidemiological Society of London, 1866.'

[†] 'Ancell on Tuberculosis,' 1852, p. 377.

[‡] 'Brit. Med. Journ.,' Oct. 28, 1876.

[§] Op. cit., p. 329.

[||] 'Diseases of Children,' p. 842.

The sudden manner in which tubercular disease sometimes springs up without any obvious exciting cause, is suggestive that an over-excited, or ill-nourished organ, may initiate the peculiar deposit in the track of the blood-vessels, and there set up decay and destruction.

In those cases in which pneumonia and bronchitis are associated with tuberculosis, it is a disputed question whether the inflammation is a secondary affection, or whether it has been the essential and true cause. Both views have some show of reasoning, and I shall therefore consider the subject at some length. We may repeatedly witness children whose general health fails for months together, when the physical signs afforded by auscultation and percussion reveal no evidence of abnormal change in the pulmonary organs. The disease may advance considerably before they afford any proof of alteration, and there may be extensive tubercular deposit, which is unsuspected.

The plasma exuded in states of acute inflammation resembles so closely that which is poured out in low forms of disease, happening to cachectic and tubercular subjects, as to be almost identical. In the former case, the essential difference consists in its vital endowments, or capacity for higher organisation; whereas in the latter it has no power to advance in this direction, and the exudation remains much in the same condition as when it was first secreted. The physical and general signs, too, between a case of chronic pneumonia in a weakly person and tubercular infiltration, are so closely allied that, notwithstanding that the history and progress of the two affections may be some guide to diagnosis, they constantly fail to put us in possession of any conclusive evidence. Now, it is worthy of notice, that a general cachexia regulates the anatomical character of all these exudations. The children of consumptive parents may bear characteristic proofs of the disease, but all do not die of phthisis—some may attain to a ripe old age, and others as they reach maturity drop off one by one. Every child bears traces of the constitutional diathesis in the delicacy of form, accelerated circulation, and general appearance; but some have escaped the circumstances which call tuberculosis into action. The different functions of the body are languidly carried on, and enough nourishment is appropriated for the maintenance of life; or from some unforeseen causes (ever ready to come into operation) a period arrives when an inflammatory affection of the lungs, or some other part, springs up. Through perverted nutrition, the exudation or effusion of coagulable lymph takes place and local disease is initiated. Here is an argument suggesting the probability of a new power or agent suddenly altering the nutrition of an organ; but it may be contended, with equal force of reasoning, that the exudation was there slumbering and undiscovered, and only required the stimulus of external causes to rouse it into action. I think strong arguments may be adduced on either side. It is evident that the earliest signs of inflammation should be looked for in those persons who manifest the tubercular cachexia. It will, I think, accord with the experience of most physicians that there is a susceptibility to irritation and congestion of the pulmonary organs from trivial causes in these cases, similar to what occurs in the different textures of the body, when the blood is contaminated by noxious elements, which the impaired or damaged secretory organs are unable to eliminate from the system.

"Catching cold" is so constantly assigned as the starting-point of active pulmonary disease, that we cannot escape from the conclusion that it is no mean factor in the development of tuberculosis. There is a case recorded by Dr Hermann Weber* of a boy, ten years of age, the son of healthy parents, who had an ordinary sore throat, in August, 1871. This was followed about the twelfth day by pain in the right side of the throat, extending to the ear, and causing deafness; the tympanic membrane became yellowish and prominent, and Dr Weber suggested that it should be perforated, and if the advice had been carried out it might have saved the child's life. In November, 1871, he began to cough, and was sick and feverish; the pulse was 130, and the temperature 103°. The chief symptoms were headache, sleeplessness, constipation, and dry cough; crepitant rhonchi were heard, but no dulness. There was deafness, but no discharge from the ear, and the urine was non-albuminous. There were two temperature elevations every day between 103° and 105°, and two depressions to between 98° and 100°, and the pulse varied from 65 to 160 in the minute. The boy died, November 26th, and during the last few hours of life the temperature rose from 101·5° to 106°. On a post-mortem examination grey miliary tubercles were discovered in the pleura, pericardium, liver, and meninges of the brain. The right temporal bone and internal ear were normal, but the tympanic cavity was filled with soft caseous matter.

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* 'Clinical Transactions,' vol. viii, 1875, p. 135.

Indifferent health may be present in a large number of cases for years, and the patient may remain free from any actual disease; but when exposure has led to cough and febrile symptoms, then ensue the usual signs of bronchitis, accompanied with expectoration. No dulness is to be detected below the clavicles at first, or above the spine of the scapula; but, at a later period, this significant sign is added to the rest, and we are irresistibly led to believe that we are dealing with a case of pulmonary phthisis, originating in catarrh. In many young persons, when the chest yields a clear note on percussion, and there is bronchitis affecting the smaller as well as the larger tubes, the lungs are found studded with miliary tubercles after death. Death has been so rapid in many instances that the development of these granulations must have preceded the last inflammatory attack to have reached such a mature stage. The diminution of resonance (often not to be detected) does not become apparent in these cases till the bronchitis has existed for some considerable length of time.

When tubercle is being deposited in the lung, bronchitis is one of the most common attendant symptoms in young subjects. If the bronchitis is persistent, and does not yield as readily as the uncomplicated affection, it excites suspicion of tuberculosis; when tubercle is disseminated equally through the pulmonary organs, the sign of consolidation is sometimes wanting, and this is apt to lead us astray. In a depraved state of health the formation of tubercle takes place rapidly or slowly, and general crepitation may be detected throughout the chest; but there may be neither dulness nor prolonged expiration. There is but little cough, and, if the subject is young, the expectoration is swallowed. As the disease advances, these last symptoms become more developed, hæmoptysis occurs, the lips become livid, the extremities cold, and delirium may supervene. These are, of course, rapid cases, and strictly bear the name of acute phthisis.*

Febrile symptoms are significant, and when the attacks are severe or frequent they will generally be found dependent on the rapid formation of tubercles. But persistent feverish symptoms are sometimes met with in young children, when there are no signs of a local character in the chest—no cough, no wheezing—and yet after death the lungs are found to contain tubercles. "I attended a little boy," says Dr James Russell, of the Birmingham General Hospital, "aged six, with one of the most experienced surgeons of this town. His illness lasted for eight weeks; my attendance comprised the last week only. His sole symptom was persistent feverish reaction, though with scarcely any delirium; the one single symptom of a local character was constant rapidity of breathing. The child's chest was searched over and over again, both by my colleague and by myself, for any indication of disease, but, to the very last, percussion was normal; not even a wheeze could be discovered; and there was entire absence of cough and expectoration. Death was rather sudden, I suspect, from fainting. On examination, both lungs were positively filled with tubercles."† No mention is made of the temperature, but the feverish reaction and rapid breathing were very significant. If the half of one lung is obstructed in its functions by the rapid development of tubercles, they must occasion serious mischief by diminishing the power of the respiratory apparatus. In some cases, where the production of tubercles is rapid and general, a state of tubercular asphyxia takes place, attended with embarrassed breathing, bordering on suffocation, without suppuration in the lung, or the usual symptoms of phthisis.

What is the pathology of such a frequent case as this? A young person takes cold in winter, and is seized with cough—spitting and dyspnœa. During the cold weather he is tormented with his ailment, and cannot lose it till the warm weather returns. The patient appears in good health, and has not lost flesh or strength; he relishes and digests his food, and there is neither sweating nor diarrhœa. He is well in the summer, but every winter has a return of the symptoms, and each succeeding attack is more troublesome to shake off than the one that has preceded it. By-and-bye the disease does not subside in the summer, and general and physical signs are added, which prove the serious nature of the affection; he now slowly begins to lose flesh and strength, and the expectoration becomes thicker and purulent; dulness is detected in one or both apices of the lungs, followed by softening, and a fatal termination. So much for bronchitis as a cause.

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* See Chap. XXXIX, "On Phthisis Pulmonalis."

† Braithwaite, "On Fever and Bronchitis as early signs of Phthisis," vol. lxi, p. 70, 1865.

If active remedies are employed to reduce pneumonia in some constitutions they may prostrate the vital powers, and lead to degeneration of the effused lymph, which otherwise might have become organised and cast off in the healthy progress of the disease. No problem in medical practice demands more consideration for its solution than that which requires us quickly to determine at the bedside how far we may safely venture with antiphlogistic remedies in acute disease. If active inflammation long assails vital organs like the lungs, and is timidly dealt with, the effused products after a while resist absorption and become irritating; and if the measures employed are too vigorous, then the general strength may either fail at once, or decline more gradually. But a deadly disorder may grow out of the attack. Rare as it is for tuberculisation of the lung to succeed pneumonia, recent investigations have shown how numerous are the sources of blood contamination, and from what slight irritation it may arise, so that we cannot dismiss the danger from our minds where a large extent of lung is involved in inflammation, even if no predisposition exists.

Symptoms.—Tuberculosis may be *acute* or *chronic.** In the former several organs are affected; in the latter only two or three. Acute tuberculosis sometimes begins as a general disease, with fever and deranged nutrition; and hence the difficulty of diagnosis at an early stage. In a few and exceptional cases the onset is very sudden; headache, vomiting, stupor, restlessness, and high fever, with constipation or diarrhœa, mark its commencement. The disease in the majority of cases begins insidiously, and for a time, an alteration in the manner of the child is the chief noticeable sign of a departure from health. He lies about for days and weeks together, and is fretful and indisposed for any kind of exertion; he loses his customary cheerfulness, and his toys and playmates cease to amuse him. Among the earliest symptoms I have noticed is pain in the stomach, the child being frequently brought under our notice by his parents for this solitary symptom, when the more general and common features of the disease, as loss of flesh, thirst, and evening paroxysms of heat, have not yet indicated their approach. I have noticed this symptom of gastric pain, and occasionally vomiting, even when great care has been bestowed on diet and regimen. For weeks together this symptom may continue, and while it lasts, digestion is interfered with, the patient loses flesh, and has a pinched and exhausted look. It is often the evidence of mischief about to spring up in the abdomen or peritoneum, when the lungs are free from tubercle.

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* See Chap. XXXIX, "On Pulmonary Consumption."

Among other early symptoms is a capricious appetite, sometimes amounting to hunger, whilst at other times the stomach is so irritable that food is only retained for a short time. If the food remains long undigested it creates pain, flatulence, acid eructations and diarrhœa. When the appetite is capricious there is a dislike for any kind of fatty food, thirst is commonly present, and the pulse is habitually quick and weak. After a time feverish symptoms are developed, sickness is of frequent occurrence, and the nights are restless. The mischief creeps on so stealthily that it is impossible to fix on the date when the child first began to fail. When illness once becomes apparent, the child is often considered to be suffering from a feverish attack and deranged digestion, when suddenly a convulsion sets in, followed by meningitis, or cough, and other symptoms indicating that the mischief is concentrated on the lungs. This may happen in the course of five or six weeks from the beginning of the illness.

It is a distinguishing feature of acute tuberculosis in childhood, that several organs may be affected at one and the same time—the lungs, the liver, the pleuræ, the spleen, the kidneys, and the peritoneum, when special symptoms common to disturbance in these organs become developed. The general symptoms, however, may be present, as in the *chronic* form, for an indefinite period without our being able to trace any local lesion; and when this is so, we shall presently see that elevation of temperature is the most reliable ground for diagnosis.

As the disease advances the child looks pale, and is indisposed to move about, the face wears a pinched and anxious expression, and towards evening it is flushed, and the hands and feet are hot. The child does not care for his food, but will ask, if old enough, for water to allay its thirst. The wasting of flesh now becomes very apparent. The abdomen begins to lose its natural shape, and is flattened or slightly concave; the ensiform cartilage is prominent, and the line of the receding ribs is sharply defined; the edge of the liver and spleen can sometimes be felt below the thoracic margin, but the belly is not tender on pressure. The motions vary in colour and consistence, being deficient in bile, and the bowels are costive or loose; at other times the motions are dark, or they have a glairy appearance like the white of an egg. The tongue is glazed at the dorsum, or it is of a bright red hue at the tip and edges, and the papillæ are prominent.

The *urine* may be acid and turbid on standing, throwing down pink or even white lithates, or it may be quite clear and of high specific gravity; sometimes there is a trace of albumen, and not rarely it is loaded with phosphates. If the local symptoms remain obstinate, a state of hectic fever is established, and under emaciation, high temperature, and sweating the patient gradually sinks.

There are four symptoms that call for special notice. 1. Temperature. 2. Sweating. 3. Pulse. 4. Respiration.

Temperature.—Wherever the deposition of tubercle is taking place, the temperature, with few exceptions, gradually increases in elevation. Of twenty-four cases recorded by Dr Ringer in which tubercle was being deposited in the lungs, in twenty-one there was a continued elevation of the temperature of the body, and in these twenty-one cases the deposition of tubercle was proved during life by increase of physical signs, or after death by the post-mortem appearances.* The temperature has been noticed not to exceed 99° in some cases of acute tuberculosis, and that in the evening, when the maximum temperature is usually attained. It must be admitted that these cases are exceptional. Very frequently the temperature is normal in the morning, but about 5 p.m. it rises to 100° or 101°, and sometimes it does not rise higher as night approaches. In my own experience the temperature has been persistently higher in the evening than in the morning. When the process of deposition has ceased, the temperature may fall to the normal point. It seems evident that when the granulations have become quiescent and ceased to irritate, tuberculosis is curable. These cases are unusual, though they occasionally happen. Bronchitis, so commonly associated with the softening of tubercle, is a symptom to be expected, and in such a case we have a rise of temperature, probably proportionate to the tubercular infiltration and the bronchitis set up by it.

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* 'On the Temperature of the Body as a means of Diagnosis in Phthisis and Tuberculosis,' 1865, p. 5.

Small deposits of tubercle, when scattered through a considerable portion of the lung, are not to be detected by physical signs, and we may not suspect such a condition till a disease like broncho-pneumonia or pleurisy sets in. The tubercles may be too few in number to interfere with the proper aeration of the blood, or to excite cough or dyspnœa. Most of the symptoms of failing health and delicacy in a young person are put down to some change of constitution in the absence of cough and expectoration, but the mischief has long been resident in the lungs, and the inflammatory attack only was wanting to rouse the graver evil. Some years ago I met with a young person who caught cold, and got an attack of pneumonia. There were frequent dry cough, increased frequency of respiration, bronchial breathing, accelerated pulse, wasting, and high temperature, but no expectoration or moist râles. Percussion was dull and bronchophony was general over the posterior surface of the lungs. The patient apparently recovered, but two years later died with all the symptoms of pulmonary tuberculosis. For years she had been delicate, and her family feared she might die of consumption, but one medical man after another assured her friends there was no deposit of tubercle.

There are many cases of children dying of tubercular meningitis, in whom tubercle is also met with in the lungs and peritoneum, who have exhibited no symptoms of its presence in them during life, and yet after death it is found so abundantly scattered through these organs, that it becomes a mystery how it was that we did not discover the morbid changes that were going on by some general or physical signs. Even the cerebral ymptoms are sometimes so rapid and unexpected that the source of mischief must have been lying dormant for some considerable time.

When, moreover, it happens in tuberculosis that the weight of the body is kept up (and this is not unusual if the appetite is good, and there is no exhausting diarrhœa going on), we are the more driven to rely on a continued elevation of temperature as the only sure point of diagnosis in doubtful cases. For a considerable time the temperature may continue high, and the weight of the body remain undiminished just as in many cases of ordinary and advanced phthisis the patients retain their weight when eating well and taking cod-liver oil. But this symptom would not justify us in concluding that the disease was arrested, unless physical signs were present also, and showed improvement.

The temperature in tuberculosis is subject to much variation. When in any given case of illness in a young person it is daily elevated for a considerable period, and the continued fevers can be excluded, we may suspect tuberculosis, even if the general symptoms scarcely point to the possibility of this condition. We must be sure that the thermometer is correctly registered before it is placed in the axilla, and that the arm is kept well against the side for ten minutes or a quarter of an hour. In young and fractious children the thermometer should be inserted in the rectum, and one minute will be enough for each observation. The temperature is said to be so slightly altered in some cases that it scarcely exceeds the normal standard, but my experience induces me to think that it seldom remains so, if tubercle is being deposited. Soon the evening temperature is slightly elevated, and later on, in some instances, there is a rise both morning and evening.

Dr Wilson Fox* says that "Lebert found in 22 cases the mean evening temperature of acute tuberculosis was as follows:—In 2 not exceeding 100·4°; in 8, including those last mentioned, not exceeding 102·2°; in 9, more than 103·4°; in 4, from 103·4° to 104°; in 1, from 104° to 105·5°." Dr Fox found that a temperature of 104° was not exceeded by 62·5 per cent. in acute tuberculosis, and by 36 per cent. in acute phthisis. Temperatures exceeding 105°, with two exceptions (acute rheumatism and phthisis), are found exclusively in acute tuberculosis. Both Wünderlich and Lebert record cases of hyperpyrexial temperature before death. The latter mentions one case where it rose to between 107° and 108°, and as we have noticed (p. 456), the temperature reached 106° shortly before death in Dr Weber's case.

When tubercle is forming the temperature may rise to 106° or more. Dr Theodore Williams has recorded a case of phthisis in the "active third stage," in which the maximum temperature was 104·6°, and the minimum as low as 93·6°.† There is often a rise after 2 p.m., or, as is frequently the case, about 5 p.m. At the latter time it not unfrequently rises to the highest point in tuberculosis. It is possible that tubercle may form and the disease advance without any rise of temperature, which is perhaps due to exhaustion and collapse. The last writer also mentions a case of phthisis, in which active disease was going on, and there were night sweats and hæmoptysis, and yet the temperature was normal throughout.* If it is the rule to meet with a high temperature in tuberculosis, it should not be forgotten that the lungs may be studded with tubercles, and the temperature remain persistently low.

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* "On the Temperature, Pulse, and Respiration in Phthisis and Acute Tuberculisation of the Lungs," 'Med.-Chir. Trans.,' vol. lvi, p. 397.

† "On the Temperature in Phthisis Pulmonalis," 'Med.-Chir. Trans.,' vol. lviii, p. 95.

Sweating, which reduces the general strength, is a common feature in cases of phthisis, though it is not even a necessary feature here. Where the temperature remains persistently high for some time and then begins to decline, sweating is met with. In cases of nervous exhaustion and general weakness it is to be anticipated, so that, though it is not an invariable rule in phthisis or tuberculosis, the debility consequent upon either of these last conditions may produce it independently of elevation in temperature. The sweating that is due to a febrile condition of the body is generally noticed as the fever declines, and it thus becomes a natural and efficient means of reducing the fever without the aid of drugs; but when it comes on from sleep or exertion or fasting, it is due to exhaustion. How far these conditions may coexist—viz. fever and debility—is a point we cannot always easily decide, but, as the case advances, the difficulty is cleared up. Sweating, therefore, is a far less certain indication of tuberculosis than a persistent elevation of temperature; though, where the latter condition exists, too much importance should not be attached to it as a significant sign.

Pulse.—The pulse is another and more valuable guide than sweating. As the temperature rises the pulse usually increases in frequency; but this is not an invariable rule, for the temperature may reach a high point, as 103° or 104°, and yet the pulse remain infrequent, and the respiration quiet. I am inclined to think that when the pulse and respiration remain slow, and the temperature goes on rising, the patient is often in a perilous position, and that more correspondence in the relations are preferable for a hopeful diagnosis, than when the variance is so great. The pulse therefore is no guide in the absence of fever. Then, too, when the temperature is falling, debility and exhaustion may send up the pulse, so that this is not an infallible guide—a nervous or hysterical temperature will accelerate the circulation, and this may deceive some persons if they are not aware of the condition. The pulse, therefore, as a guide to the diagnosis of tuberculosis, is of less value than the elevation of temperature. An accelerated pulse is not constant in acute tuberculisation of the lungs. When the disease is progressing or established the pulse is generally quickened. When it is slow, and accompanied by a low temperature, there is more chance of the disease being arrested or cured. Of the relation between the pulse and the morning and evening temperatures, Dr Fox found in 54 cases that the evening pulse was quicker than the morning in 20 cases; it was slower than the morning in 22 cases; the evening pulse equal to thé morning in 12 cases. Of the mean pulses, in 46 cases, the evening pulse was quicker than the morning in 28 cases; the evening pulse was slower than the morning in 12 cases; the evening pulse was equal to the morning in 6 cases.

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* Ibid., p. 79.

The respiration becomes accelerated in proportion to the severity of the disease, and that in the evening is somewhat in excess of the morning. Sometimes quickness of breathing is the chief but overlooked symptom in acute tuberculosis; and I should attach extreme weight to such a symptom. The respiration, as may be expected, bears a close relation to the quickness and slowness of the pulse. In health they correspond, and in fever as the circulation is accelerated the respiratory movements become more frequent; blood is transmitted with greater frequency to the respiratory centre, and stimulates it to increased activity. When the tuberculosis is intense there is usually acceleration in breathing, and both in the morning and in the evening the respirations are above 30 in the minute. In 54 cases of the quickest pulse, the evening respiration was quicker than the morning in 25 cases; the evening respiration slower than the morning in 23 cases; the evening respiration was equal to the morning in 6 cases. In 54 cases of the slowest pulse the evening respiration was quicker than the morning in 24 cases; the evening respiration slower than the morning in 17 cases; the evening respiration equal to the morning in 13 cases.

But between the rate of the pulse and the temperature, as I have previously stated, there is no necessary relation. The temperature may be high, and the pulse slow, or *vice versâ*. We may have a morning pulse of 140 and the temperature 97°; the evening pulse may be 130 and the temperature 95° or 96° [Wilson Fox]. Those cases which are distinguished by a rapid pulse are commonly those where the temperature is highest, and low pulses are generally met with where the temperatures are low.

The relation of the respiration to the pulse is more definite than it is to the temperature. A slow pulse is usually accompanied by slow respiration, whether it be morning or evening; but the pulse may be slow whilst the respiration is rapid. The pulse is more influenced by the temperature than the breathing. A slow pulse and rapid breathing may coexist with low temperatures, but a quick pulse and rapid breathing may also be associated with a low temperature. Quick breathing may be associated with a slow pulse, and in exceptional cases, slow breathing with a quick pulse; thus in one case of acute tuberculosis, the quickest pulse was 136, and the respirations were 28; the slowest pulse was 88, and respirations 32. Some condition of the nervous centres due to exhaustion may possibly explain this. When the pulse and respiration are both low the temperature is generally normal, or nearly so. Pyrexia may exist with little acceleration of either; or the temperature may be high and the pulse quick, whilst the respiration is scarcely accelerated. This applies to some other febrile states besides tuberculosis. According to Dr E. Smith and Dr Fox, rapid pulses with slow breathing are not observed in the early stages of phthisis.

For many of the foregoing calculations concerning the relations of the temperature, pulse, and respiration in tuberculosis I am indebted to the perusal of Dr Fox's paper on this subject, who has collected a large number of facts from his experience and that of others.[*]

Diagnosis.—Of all the diseases with which acute tuberculosis is likely to be mistaken, typhoid fever is the most frequent. The error is of common occurrence in those cases of tuberculosis which set in suddenly with severe headache, high fever, restlessness, and stupor. As in some other acute diseases of children, it is impossible to be certain at the onset, and we are bound to wait till a later stage. I have been called within the last three years to two cases of tubercular meningitis which were supposed to have been typhoid fever.[†]

In doubtful cases of diagnosis we should be careful to inquire into the history of the case. Tuberculosis is most common in very young children, typhoid fever is rare under five years of age; in tuberculosis the patient loses its animation, and the health has for some time failed before the sudden outbreak to which allusion has been made. In tuberculosis the abdomen is generally flat or concave, constipation is frequent, and the motions are hard and lumpy; in typhoid fever the abdomen is prominent and diarrhœa is common; in tuberculosis there is no necessary enlargement of the liver or spleen, whereas in typhoid fever it is constantly to be noticed; in tuberculosis (in ordinary cases) the fever is moderate and creeps on slowly; in typhoid fever there may be a rise of two degrees on the first day, and five degrees on the fourth day.[*]

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[*] 'Med.-Chir. Trans.,' vol. lvi, 1873.

[†] See Chap. VI, p. 53.

Prognosis.—This is always unfavorable, but when the brain and pulmonary organs have escaped, we may have hopes of the disease being arrested. Such cases have been recorded.

The two following cases are interesting.

CASE 1.—Jane C—, æt. 6½ years, first came under my care at the Samaritan Hospital on October 24th, 1874. She was an intelligent child with fair hair and grey eyes, and had grown beyond her strength. During the winter of 1873 she had had an attack of croup, and had been ailing ever since. Her father and mother were healthy, but a younger brother was the subject of rickets. She was too weak to take any exertion, and in the evening was feverish and hot, with a bright circumscribed flush on the left cheek. It was seldom observed on the right cheek. The chief symptoms complained of were pain in the stomach and constant sickness, so that she could retain nothing that she swallowed. She had a short, frequent, and troublesome cough, and expectorated a little thin phlegm; she complained of thirst and headache, and the tongue was covered with a thick white fur; latterly, she had become irritable and fidgety, and it was difficult to amuse or please her. There was some obscure dulness under the left clavicle, but no harshness of breathing or moist sounds; the cardiac sounds were very distinct under both clavicles. The temperature was 104·5°, pulse 160, resp. 40. I ordered the child to be kept in the prone position till the sickness was relieved, and to be fed frequently with a tablespoonful of milk and lime water. In the shape of medicine, citrate of potash was given in effervescence with hydrocyanic acid. She was to be sponged with tepid water in the evening, and if free from pain, to have a grain and a half of quinine in a powder at bedtime before the paroxysms were expected.

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[*] Ibid., p. 49.

27th.—The child was better, but the flushing had continued regularly morning and evening; any fatigue or excitement brought it on. The sickness and pain in the stomach were abated, she slept quietly at night, and made no complaint of headache; the tongue was cleaning at the tip and edges; pulse 96, temp. 99°. As the bowels were inclined to be costive, and the motions green, I prescribed a powder at bedtime, consisting of grey powder, bicarbonate of soda, and powdered rhubarb, of each two grains.

Nov. 10th.—She was much better, having had flushing of the face only twice the previous week on the same day; the sickness was completely arrested, and the bowels acted regularly every morning; the tongue was clean, and she was bright and animated; pulse 92; temperature 99·1°; respiration 24; urine clear. When the fever was off her she was to take the quinine powder three times a day. Since last visit she had taken a pint of milk daily, besides beef tea and mutton broth.

24th.—She had much improved, her cheeks having filled out, and her appetite amounting to hunger. The temperature was only 98°, the pulse was 140, and this probably from nervousness, as an attempt at examination was enough to cause flushing. She had flushing of the left cheek from over-excitement at play; it had been noticed on both cheeks, but generally on the left—never on the right cheek alone. She spat up a good deal of phlegm, and often had the feeling of wishing to clear her throat; the bowels were quite regular. Since her illness began she was generally restless in her sleep, and at these times was always flushed; the abdomen was increasing in size, and her clothes came together round the waist with difficulty. The mother noticed this swelling for the first time a week before. The region of the liver was smooth, but slightly projected below the ribs, and the belly generally was tumid and protuberant, though free from pain and tenderness. She was ordered a teaspoonful of cod-liver oil twice a day, and as much nutriment as she could digest comfortably.

On December 8th the report states that the bowels had become very loose; the motions being dark and ragged looking; she complained of pain in her eyes, and there was headache; since the diarrhœa began there had been more flushing, which kept to the left cheek; the abdomen still increased in size. There was more cough, and some dulness below the spine of the left scapula, with mucous rhonchus. The mother refused the child to be admitted as an in-patient, and I did not see her again till November 6th, 1875, when, on calling at her house, I ascertained the following facts:—After her last visit she remained ill for about a month, and then gradually regained her flesh and strength, and her body returned to its normal size. The medicine was continued regularly during this time. The chest now expanded well, but the percussion note did not appear to be quite so clear on the left side as on the right, and there was dulness in the supra-scapular space of the same side, but no moist sounds anywhere. There was no enlargement of the liver or spleen, and the belly was soft and natural. Allowing for some excitement at my unexpected visit, I found the pulse did not exceed 84, respirations 24, temperature normal. The child was in every respect healthy, and went to school regularly. I see no reason to deny the possibility of a deposit of tubercle in this case, and the fall of temperature indicates its arrest, if not its cure.

CASE 2.— P. E—, æt. 12, was first brought to me on the 19th of April, 1875; he was the son of healthy parents residing in an elevated district in the neighbourhood of London, and had five brothers and one sister. The eldest brother died at fourteen years of age of heart disease, apparently unconnected with rheumatism. He had always experienced fair health till six weeks since, when he took cold, and had feverish symptoms at his school in Staffordshire, where the atmosphere was damp and humid. His illness was thought to be whooping-cough, but this was doubtful as no medical man was consulted, and after his return home his parents never heard him whoop. His second brother, who went to the same school, was lately seized with rheumatic fever, and died there. He had lost much flesh, and was very thin, his clothes hanging loosely on him. He was a slender and delicate lad, with downcast eyes, and a sad, wearied expression; the veins were very prominent and distended over the front part of the chest, and the spine was much curved from weakness, the lower angle of the right scapula being within an inch of the spine; the left was three inches from it. Phthisis was not hereditary, and no member of the family on either side appeared to have suffered from it. The symptoms complained of were great languor and prostration of the strength; he had little inclination to enter into any amusement with his brothers, and if he did he was soon fatigued and glad to lie down. He had a short, frequent hoarse cough, and spat up a little light tenacious phlegm in the day time, but more particularly in the morning on waking. Towards evening he became flushed, and complained of headache and thirst; his mother noticed that he was restless in his sleep, and that the skin was hot and not sweating. On examination of his chest the expansion was good and equal under both clavicles, though, in consequence of his having lost so much flesh, the depressions above and below the clavicles were very marked, and the shoulders rounded and bent forward; the percussion note was resonant, and the vocal vibration greater than usual, but this was explicable on the ground that the thoracic walls were very thin, and the intercostal spaces everywhere depressed.

A similar reason may explain the loud and rather harsh character of the respiration under both clavicles, but there were no moist sounds. On percussing the back the dulness was greater in the supra-spinous fossa on the left side than on the right; but in the absence of submucous or sonorous rhonchus, the result of this physical examination did not enable me to pronounce the patient tubercular when I was pressed for an opinion. I thought he was, and that in the course of a short time I should detect unmistakable evidence of such pulmonary changes that all doubt would be set at rest. The skin was dry and harsh, the temperature 102°; the pulse 136; the respiration quiet; bowels costive; urine clear and non-albuminous; the tongue presented a whitish coating, and the appetite for food was imperfect, which in genuine tuberculosis is sometimes craving and voracious. I ordered him a diet of beef tea, milk and eggs, and he was to have cocoa instead of tea. In the shape of medicine two grains of quinine were prescribed, morning and evening, and a syrup composed of squill, senna, and poppy to soothe his cough and keep the bowels open. (Form. 64—74.)

May 13th.—He looked marvellously better, being fuller in the face and more animated; he had coughed less, and was never flushed in the evening; his appetite was greatly improved, and he rested well at night; pulse 112; respirations 24; temperature 98°. For three days he had complained of pain in the right side, below the nipple, which was increased on coughing or taking a deep inspiration, but as auscultation revealed nothing abnormal, the pain was probably neuralgic or muscular. The chest sounds were the same as at the last report, but there was some laryngeal irritation and hoarseness. He was ordered to apply a warm poultice to the side at night, and to use a sponge bath with Tidman's sea salt every morning. A mixture, containing hypophosphite of lime, quinine, strychnia, and tincture of perchloride of iron was substituted for the simple quinine mixture.* This is an excellent combination in cases of anæmia and nervous exhaustion, and the slow blood change which occurs in the diatheses of struma, syphilis, and tubercle.†

June 9th.—The laryngeal irritation had not lessened, and the cough was hacking and troublesome in the morning, but unattended with expectoration; there was no sweating, and he slept well. Nearly three months later (at the end of August), after gaining flesh and going on remarkably well, he became faint and languid and lost his appetite from indiscretion in diet. He was irritable and fretful, and nothing went right with him, which was attributable in a great measure to over fatigue and excitement in the hot weather. His voice was now clear, and he did not suffer from cough or laryngeal irritation. The chest sounds were normal. He derived the greatest benefit from the hypophosphites, and a month later went to Brighton apparently well.

I might relate other cases, of a mixed and puzzling character, allied to genuine tuberculosis in many of the local and vital symptoms. If the lungs and other organs appear to be free from the deposit of tubercle at the time a patient comes under observation we may pronounce the illness as simple and uncomplicated, and give a favorable opinion, because recovery, so far as I have been able to trace the progress of the disorder, has sometimes followed the continuance of a class of symptoms which have borne the closest connection with what appeared to be at one time an irremediably hopeless condition.

We will consider the treatment in the next chapter.

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* Form. 73:
℞ Calcis Hypophosphitis ℈ij
Tinct. Ferri Perchl. ʒiss
Quiniæ Sulph. gr. vj
Liquor Strychniæ ʒss
Syrupi ℥j
Aquam ad ℥vj.
M. A tablespoonful three times a day.

† See a paper by the author "On the Hypophosphites of Iron, Quinine, and Strychnia in cases of General Debility and Nervous Exhaustion," 'Clin. Trans.,' 1870, vol. iii, p. 1.

CHAPTER XXXIX

PHTHISIS PULMONALIS OR PULMONARY CONSUMPTION

Definition of the term—Nature of the disease—Analysis of the blood in phthisis—Tubercle bacillus—Varieties of phthisis.—ACUTE PHTHISIS (ACUTE TUBERCULOSIS).—ACUTE PNEUMONIC PHTHISIS—*Galloping consumption.*—BRONCHIAL OR CATARRHAL PHTHISIS (CASEOUS OR SCROFULOUS PNEUMONIA).—CHRONIC PHTHISIS (CHRONIC TUBERCULOSIS—TUBERCULAR PHTHISIS).—FIBROID PHTHISIS (CIRRHOSIS OF THE LUNG).—*Constitutional symptoms vary—Hæmoptysis—Bacilli in sputa of phthisis—Physical signs of the different stages—Duration of the disease—Complications.*—CAUSES—*Predisposing and exciting—Inflammatory origin of—The scrofulous diathesis—Hereditary tendency—Anæmia—Exhausting illness.*—DIAGNOSIS OF ACUTE PHTHISIS FROM TYPHOID FEVER.—TREATMENT OF TUBERCULOSIS—*General management—Effect of quinine and purgatives—Cold sponging—Cod-liver oil—Change of air—Sea bathing.*—TREATMENT OF PHTHISIS *to be regulated according to the stage of the disease—Early or incipient phthisis—Attention to the digestive functions—Avoidance of cold—Warm clothing and attention to the general health—Counter-irritation—Sea-side residence—Action of belladonna in controlling night sweats and diarrhœa—Sulphate of atropine—Vinegar and capsicum as a local application—Management of the second or confirmed stage of the disease—To encourage expectoration, when it is copious and oppresses the patient, by emetics of sulphate of zinc and ipecacuanha—Treatment of cough—Hæmoptysis and diarrhœa—Management of the febrile paroxysms—Hypophosphites of lime and soda—Calumba—Bark—Preparations of iron—Quinine—Strychnia—Cod-liver oil—Phosphoric acid—Antiseptic inhalations.*

IT may be well now to consider the disease called phthisis from a special or clinical point of view. Already I have referred to it with regard to its relation to tuberculosis. Now there are forms of phthisis not clearly tubercular, but as tubercle bears so close a relation to this subject, I must again repeat much of what I have said in the chapter on tuberculosis, just as in that chapter I was obliged to anticipate much that will be said on phthisis here.

The usual acceptation of the term pulmonary phthisis means wasting away. It consists in ulceration or disintegration of the pulmonary tissue. It is a constitutional rather than a local affection, associated with malnutrition and a depraved state of the blood. The severity of the general symptoms at an early stage, bear no sort of relation to the local lesions that exist. In England it is both common and fatal, on account of the variable temperature of this country. It spares neither sex nor age, but the young are its special victims.* As we have said before, when speaking of tuberculosis, phthisis, which in its commonest types is allied to that disease, is often associated with a certain delicate physical beauty, and with high mental qualities. The gradual sinking and death of a typically phthisical subject has a painful, yet picturesque aspect, which has not escaped the notice of artists, poets, and writers of works of fiction. Those who are fair and beautiful, refined and accomplished, succumb rapidly or gradually to its ravages.

The leading constitutional symptoms which denote its presence are a gradual decline in the general health, and a persistent and harassing cough, with little or no expectoration at first, accelerated breathing and pulse, febrile paroxysms, night sweats, disturbed sleep, emaciation, diarrhœa, and occasionally sudden death. The physical signs are those of pulmonary congestion, followed by consolidation, and eventually by the breaking down of the lung itself.

The peculiarities which distinguish the deposition of tubercle in early life are strikingly different to what we observe in later years. In children there is a tendency to the diffusion of tubercle in the chief internal organs—as the brain, the lungs, liver, spleen, kidneys, bronchial and mesenteric glands, whereas in adults the pulmonary organs are remarkably prone to suffer. The disease may continue in one lung for years, and ultimately cause death without spreading to the other. Cavities are not common in the lungs of children. When present they are smaller than in adults and sometimes numerous. The general diffusion of tubercle in children lends considerable support to the view that tubercle is a primary growth, and the changes that subsequently ensue are owing to inflammation[*] (see page 446). This new growth is a specific and distinct disease, wearing a different aspect at different stages of its existence, according as it is found in the interior of organs, upon the skin or the free surfaces of the serous and mucous membranes.[†]

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* Of 584 cases noted by Dr Austin Flint, only one case occurred under ten, and one half the cases occurred between twenty and thirty. Dr Dobell's 'Reports on Diseases of the Chest,' vol. ii, 1876, p. 19.

The blood in phthisis contains a diminution of red corpuscles, and of the hæmoglobulin, whilst the number of leucocytes is increased.

Niemeyer considers that phthisis, as a disease, has nothing to do with tubercle, which is only an accidental and secondary product when found in the lung, and the result of the inspissation of inflammatory products, leading to destructive and ulcerative changes in the lung tissue, but most authorities will not accept this view; they believe in the unity of phthisis—that phthisis is tuberculosis. Dr Hughes Bennett, Dr C. B. Williams, Rokitansky, and others define tubercle as a molecular exudation separated from the blood-vessels, arising from a low degree of vitality, and having a tendency to softening and degeneration. Every form of tubercle may run one into another—thus, the miliary or grey may pass into the yellow or caseous, the infiltrated, encysted, or cretaceous (see page 448), and all may exist in the same subject.[‡]

Dr Heneage Gibbes showed at the Medical Society during the debate on the "Relation of the Bacillus to Tuberculosis," specimens of the two forms of miliary tubercle from cases of phthisis which had run a very similar clinical course, and in which the naked-eye post-mortem appearances were very similar. "Microscopically, the tubercles in the one specimen were of the reticular form, consisting of a distinctly fibrillated structure with one or more giant-cells, and a caseous mass in the centre. In the other specimen the tubercles were non-reticular, having no fibrillation, no giant-cells, but consisting of irregular cells in the periphery, and a caseous mass in the centre."* Though bacilli were invariably present in large numbers in the caseous centre of the non-reticular form, on the other hand, notwithstanding that Dr Gibbes had examined a large number of lungs affected with the reticular form, he had only succeeded in finding bacilli in three cases, and in these only scantily distributed through the reticulum. Dr Gibbes has also pointed out that a lung may be stuffed with tubercles, each containing thousands of bacilli, and yet the patient may die before the destructive process has gone far enough to cause any of them to appear in the sputum.

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[*] 'Trans. Path. Soc.,' 1878.

[†] "Etiology of Phthisis," by Dr. Andrew, 'Med. Times and Gazette,' vol. i, 1884, p. 479.

[‡] 'Reynolds' System of Medicine,' vol. iii, p. 540.

The discovery of the bacillus opens the question of the contagion of phthisis, and if Koch's views can be established they may do something in this direction. At present there is nothing to support them. This experience of the Brompton Hospital negatives the idea, and opinions in favour of them ought to be received with caution. Nor does the discovery of bacilli seem to advance the question of heredity. "If they were the only agents in the causation of phthisis," as pointed out by Dr Green, then all persons exposed to the contagion ought to become tuberculous, whereas clinical experience is against the theory of contagion.† Why are some families predisposed to the disease and not others? why is it so hereditary? and why, if contagious, does it not extend from one member of a family to another? There is a transmitted tendency to the disease, a state of constitution favorable to it, and it is probable in such cases that the bacilli find a favorable soil for development. The apex of the lung being the chosen seat of tubercle, and congestion and exudation, the result of pneumonia often preceding phthisis, are opposed to contagion.

The outcome of what has been stated above is, that the relationship between bacilli and phthisis is at the present at best very uncertain, and that all hasty generalisation on the subject should be avoided.

Phthisis may be either *acute* or *chronic*. In the acute form tubercles are thickly studded throughout both lungs; in the chronic form they are few in number and chiefly limited to the apices of one or both lungs, and there is a greater chance of these diseases being arrested or cured than the acute, which have their origin in inflammation.

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* 'The Lancet,' Feb. 24th, 1883, p. 321.

† Ibid., vol. i, 1883, p. 236.

Acute phthisis (acute tuberculosis).—I have briefly alluded to this in the last chapter, and quoted a case by Dr James Russell, of Birmingham, in which the lungs were studded with tubercles, and yet the patient had no physical symptoms before death beyond rapid breathing. It was evidently a case of acute phthisis, such as we sometimes see in young subjects following cold, and in whom there is a constitutional liability to the disease. The disease is so rapid and violent in its character, that there is no time for the action of remedies, and it runs its fatal course in a few weeks. The absence of physical signs when a few tubercles are deposited through the lungs is common enough, and we often see this verified in the post-mortem room. In such cases there is frequently no dulness on percussion, and no alteration in the breath sounds. When miliary tubercles are thickly deposited through the lungs, there will be found general bronchitis announced by rhonchus and sibilus, the chest may or may not be dull in places, and the pulse and respirations are accelerated. The weakness is very great, and the wasting of flesh general. In the autumn of 1879 I was requested by a neighbouring practitioner to see with him a boy ten years of age, who was dying from pulmonary disease. Several members of the family had died of consumption. He had been only ailing a month with rheumatic pains in his joints, and had had no cough till within a few days of my visit. We found him sitting up in bed perfectly collected and intelligent, but breathing rapidly; the livid lips, the pallid face, the coldness of the hands, and the failing pulse, told of his approaching dissolution. The chest was resonant on percussion both in front and behind, but universal râles were heard throughout all diameters of the bronchial tubes, which were enormously loaded with mucus. Below the spine of the left scapula the lung was evidently breaking down, judging from the cracked-pot sound on percussion, and the bronchial breathing. I suspect that other portions of the lungs were studded with grey granulations, and some of them passing into caseous change. The patient gradually became worse and died in thirty-six hours after my visit. No post-mortem examination was permitted.

Morbid anatomy.—After death in these cases, innumerable miliary tubercles are scattered throughout the tissue of the lungs. These granulations break out like an exanthematous eruption, and by their numbers and bulk induce such an amount of obstruction to the circulation and congestion of the lungs that life terminates before degeneration or softening can take place. This form of consumption is the most rapidly fatal.*

Another form of *acute phthisis* is that which has received the name of *galloping consumption.* It is prone to seize on young subjects of consumptive family. The disease usually begins with pneumonia in one or both lungs, loss of appetite, dry lips, red tongue, thirst, cough, and expectoration. Cough is sometimes of long standing in these cases, and hæmoptysis is not uncommon. At first the fever is moderate, but in a short time the temperature may reach 105° in the evening and fall three or four degrees in the morning. The pulse is always quick and the respiration accelerated, indeed, dyspnœa is noticed at an early stage of the illness. The body and especially the thorax is burning hot, alternating with chills and sweating at night. The strength rapidly goes, and wasting is very apparent if the appetite continues bad, or diarrhœa sets in as sometimes happens, accompanied with flatulence and blood in the motions.

If the child is old enough to expectorate, the sputa, which at first are viscid, soon become opaque, purulent and nummular.

Like the former variety, this disease usually terminates fatally in a few weeks, but it is not invariably so, the disease being occasionally arrested, if the appetite returns and nutritious food, tonics and cod-liver oil are taken in sufficient quantity to support the system.

Physical signs.—These depend on the extent of destruction in the lung, and the stage at which the disease has arrived. There is dulness on percussion, arising from consolidation, to the cracked-pot sound. Bronchial breathing becomes replaced by coarse crepitation, and even gurgling, whilst bronchophony and pectoriloquy are significant of a cavity.

Morbid anatomy.—After death the lungs are found consolidated and hepatised from inflammatory deposit, and in places the yellow matter is breaking down into small and numerous cavities, containing mucus, pus, exudation matter, and broken-down lung tissue.

Catarrhal Phthisis (*pneumonic phthisis*) is a form of chronic phthisis prone to follow the broncho-pneumonia of an exanthematous affection, especially measles. I have known it to succeed an attack of croupous pneumonia which was never completely recovered from, or more frequently it may develop itself after whooping-cough and bronchitis, either acute or chronic. It is essentially a pneumonic disease; it originates in inflammation and not in tubercle. It is most frequent in children from two to six years of age. Extensive caseous changes may take place in the consolidation resulting from broncho-pneumonia, and the child may be in fair health till an acute febrile disorder, or some other derangement, rouses the exudation into activity, fresh centres appear, and the lung softens and breaks down into cavities. Where cavities exist after death fibrous tissue sometimes circumscribes them, and binds the lung to the chest wall. I have known the left lung nearly solid from caseous consolidation in a child five years of age, who had scarcely any cough, and no febrile disturbance till measles supervened, and then active symptoms were at once excited, and death took place a few days after the disappearance of the rash. After death two recent cavities were discovered in the left lung, and there was no healthy pulmonary tissue. The right lung presented no trace of disease, but tubercles were found in the liver and spleen. The bronchial and mesenteric glands were enlarged. This disease is the same as that described by Laennec under the name of yellow tubercular infiltration and scrofulous pneumonia, caseous pneumonia or tubercular pneumonia of later writers.*

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* "Pulmonary Consumption," by Drs C. J. B. Williams and C. Theodore Williams, 1871, p. 2.

It may be here stated that the liver, spleen, and kidneys are often the seat of miliary tubercle in early life; in the latter organs tubercular deposits causing scrofulous pyelitis are sometimes met with.

Symptoms.—In this variety there is generally a good deal of cough which begins early and is sometimes violent. It is of a short hacking character, and is apt to recur in paroxysms as in pertussis. The sputa, as a rule, in young children are either retained in the bronchial tubes or swallowed, and it is seldom we can see them unless there is vomiting. At first they are viscid and frothy, then they become opaque and muco-purulent, which increases with the softening process. There are attacks of dyspnœa, and weakness and loss of flesh are rapid. The child becomes hot and feverish at night, the cheeks are flushed, and he cannot obtain rest from the troublesome cough; towards morning the temperature falls, and there is sweating. When the deposit, as before degeneration or softening can take place. This form of consumption is the most rapidly fatal.*

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* 'Jones and Sieveking's Pathological Anatomy,' by Payne, 1875, p. 502.

As softening sets in the temperature rises in the evening to 102° or 103° or more, the cheeks are flushed, and there is sweating towards morning. If the destructive process is slow the child may improve for a time, and the appetite returning, the respiration becomes calm and the cough less harassing. In other cases there is vomiting and diarrhœa which exhaust the child, and sometimes, though rarely, hæmoptysis is added to the symptoms. As the softening process becomes established the general system is infected by the absorption of morbid matters from the broken-down lung tissue, greater dulness is detected, and the respiration is gurgling or cavernous. The loss of flesh is now very apparent, the pulse is quick, and the temperature at night may reach 104°. Gradually the child becomes more exhausted, and dies from cough, diarrhœa, fever, and want of rest.

A case of meningitis came under my care in January, 1885, in a boy, nine years of age, which followed an attack of pleuro-pneumonia four months previously. The strength was never completely regained afterwards. The patient, without any definite symptoms, was observed to be ailing and out of spirits; he was disinclined for food, and the least exertion brought on fatigue. There was fever towards evening, occasional cough, and restlessness at night; pallor and loss of flesh were very apparent, and pain was complained of in the right or affected side. Four months after the pulmonary attack he was admitted into the Samaritan Hospital under my care with the usual symptoms of tubercular meningitis, optic neuritis, squinting, and finally convulsions and coma. There were no symptoms to direct attention to the lungs, but on percussion the right thorax, back and front, was unduly resonant, and obscure breath sounds were heard below the clavicle. The right side was not contracted, nor were the intercostal spaces depressed. After death a caseous mass the size of a walnut was found in the apex of the right lung; the pulmonary pleura was much thickened and ulcerated in places, whilst the rest of the lung had almost disappeared. It was a condition of pneumothorax, arising from perforation of the pleura, and causing a communication with the bronchial tubes. In the left lung there were several small cavities, and one large cavity, containing a blood clot. During this last illness there was neither cough nor expectoration; the breathing on the whole was calm, and the temperature never ran high. There were, in fact, no symptoms to call attention to the pulmonary organs from the commencement to the termination of the illness.

Bronchial phthisis.—In childhood tubercle is frequently deposited in the bronchial glands where it may remain quiescent for a length of time. The disease may be primary or secondary. The glands in the mediastinum, especially the posterior, about the bifurcation of the trachea, and near the division of the primary bronchi, are first affected; they become converted into a firm, hard mass like a portion of the lung itself infiltrated with tubercle. In an early stage the glands are enlarged, soft and injected. In addition to many of the symptoms just described, there are more or less reflex spasm, difficulty in swallowing, hoarseness of voice, occasional puffiness of the features, emaciation and pyrexia.

The *physical signs* are diminished resonance over the manubrium, and interscapular dulness over the fourth or fifth dorsal vertebra; there is bronchial breathing and bronchophony over the upper part of the sternum, and if a bronchial tube is compressed, the respiratory murmur over it is feeble or extinguished. Pressure of an enlarged gland over the pulmonary artery may give rise to a systolic murmur, and to a venous hum in the neck if the superior vena cava is encroached upon by the enlarged glands. This, however, is not frequent. The next stage is one of softening, which begins in the centre of the gland, and advances till it is converted into a cyst containing pus. The contents are now and then expectorated, the cavity cicatrises, and the patient is cured. There is a greater chance of a favorable result than when the disease involves the substance of the lungs. In a few cases tuberculisation of the glands is arrested, and they become dry and contracted from the absorption of their fluid contents. This condition of crude tubercle is sometimes met with in the lungs of children who have died of phthisis or some other disease.

Chronic phthisis (*tubercular phthisis—chronic tuberculosis*) is the most common variety of consumption. It is most frequent in children from six to eight years of age, but it may happen to younger children and during infantile life. The disease generally follows the broncho-pneumonia of measles and whooping-cough. It occurs in the form of miliary tubercle, which usually selects the apex of a lung, instead of being thickly disseminated through both lungs, as in acute tuberculosis; hence the complaint is not so rapid in its progress, and there is a better chance of the disease being arrested, or followed by complete recovery. Following these granulations there is caseation, which causes consolidation of the apex, and ultimately softening and degeneration. The centre of the mass softens and breaks down into a cavity, whilst the circumference becomes harder and fibroïd in its structure. It is supposed by some authorities that all the changes can occur without the presence of tubercle, as it was once thought that all the morbid changes were primarily due to tubercular deposit. It is in such cases as these that we hear of the complaint being arrested in its first, second, or third stage, and cavities remaining quiescent for many years. There may be a difference in the changes which take place in chronic cases, because whether tubercles form early or late, they are always complicated with inflammation; the disease may begin with inflammation, and as it advances, become tubercular—tubercles added to pre-existing inflammation (tuberculo-pneumonic).

The destructive process having begun in the apex of the lung, gradually proceeds downwards, and the cavity, when of any considerable duration, presents a different appearance to those cavities which subsequently form in the centre or lower parts of the lung. The walls of the cavity in chronic cases of pulmonary disease are dense, tough, and hard; they are lined by a membrane which is more or less vascular, and pours out a free secretion. "Cavities thus lined may continue to yield for some time a purulent secretion, which gradually lessens in quantity; and all active signs of disease elsewhere having abated, the case becomes one of '*quiescent cavity.*'"* The process of destruction having been arrested, the dense cartilaginous tissue surrounding the cavity undergoes contraction, and so in time diminishes its area. Those cavities which are recent have no defined outline, their walls are ragged, soft, and irregular, and may contain pus or broken-down lung tissue. I have recorded such a case in a boy, where the cavities were very recent, although the lung disease was of considerable standing.* No induration takes place by the development of connective tissue, but the whole lung is transformed into soft yellow albuminous or scrofulous matter that resembles a sponge soaked in pus.† In the case to which I have alluded, the whole lung, except where the two cavities existed, had the appearance of a Stilton cheese, where the white and sage-looking green parts are almost equal. It is a scrofulous material which tends rapidly to caseation and decay. There is no possibility of repair in any lung so extensively infiltrated with this deposit.

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* "Clinical Lectures on Excavation of the Lung in Phthisis," by R. Douglas Powell, M.D., 'The Lancet,' 1877, vol. i, p. 523.

When these changes are taking place in a chronic cavity, the blood-vessels become impervious and thickened by hard lymph, hence hæmorrhage does not occur when vomiting or severe cough ensues. The bronchial tubes do not, fortunately, share the same fate; their destruction proceeds with that of the pulmonary tissue, and hence they remain pervious. It is through them that the products of ulceration and suppuration make their way out of the system.

Symptoms.—In this form of consumption the general health first shows signs of failure. The child gradually loses his strength and energy, is off his appetite, and is soon tired. There is indigestion and irregular action of the bowels. His hands are hot and dry at night, and one or both cheeks are flushed. After the lapse of a few weeks the child is troubled with a short hacking cough, or tickling in the throat, and in spite of remedies it persists and becomes more frequent; the respiration is hurried, the pulse is frequent, and the temperature reaches 101° or 102° in the evening. The loss of flesh is now more apparent, the temples sink in, the malar bones are prominent, and the cheeks hollow. Vomiting and diarrhœa are additional symptoms of frequent occurrence. Up to this period there may be no actual symptoms of pulmonary disease, the progress of the complaint has been so slow that it has escaped attention. The weakness steadily increasing, the child may sink from asthenia, or from an attack of pneumonia, to which he is liable.

Diagnosis.—As just mentioned the general health first shows signs of failure, loss of flesh, debility and feverish symptoms are noticeable before there is cough or physical signs to denote mischief in the lungs. When disease is detected the apices are the parts involved, there is diminished resonance beneath one or both clavicles, defective expansion, harsh breathing, and perhaps some faint crackling at the end of inspiration. In catarrhal phthisis cough begins early, and recurs in paroxysms, the wasting is not so marked, nor the appetite so impaired.

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* 'The Lancet,' 1879, vol. ii, p. 504.

† 'Pathological Anatomy,' by Wilks and Moxon, 1875, p. 344.

Prognosis.—Though chronic tubercular phthisis may sometimes be arrested for years, or even cured, its tendency is towards a fatal termination—induration leads to softening and softening to excavation. In catarrhal phthisis a caseous mass may remain quiescent, or ultimately become absorbed if the general health keeps up, and it is by no means rare to find in the lungs of a child, after death, a large caseous encysted mass of tubercle.

Fibroid phthisis (*cirrhosis of the lung—Corrigan*) is that variety in which the consolidation of the lung has undergone a fibrous induration ; it is tough, and becomes contracted when the pulmonary tissue is compressed from pleuro-pneumonia, so that no exudation is thrown out into the air-cells, and the plastic matter is confined to the interstitial textures ; if not reabsorbed it leads to contraction and consolidation.* In this disease the bronchi are dilated, because as the air enters the chest it cannot obtain admission into the air-cells.† Hughes Bennett, Addison, Wilson Fox, Bartels, and other authorities, have shown that dilatation of the bronchi is a common consequence of broncho-pneumonia in children, and that this dilatation disposes to thickening around the bronchi, and to induration of the pulmonary tissue. The parts surrounding cavities are often dense and firm. The cicatrisation of such cavities is almost always effected by the production and contraction of a similar fibrous tissue.‡ The disease may arise from pneumonia, or from pleuro-pneumonia, when the effusion thrown out into the interstitial texture of the lung becomes transformed into a tough fibrous-like tissue. "Fibroid lesions may arise from interlobular inflammations, from long-continued chronic bronchitis, from the extension of dry pleurisies into the lung, and from the transformation of pneumonic exudations. They produce contraction and induration of the lung, and occasionally dilatation of the pulmonary tissue of the bronchial tubes. Sometimes fibroid lesions lead to caseous pneumonia and to 'tubercles;' more frequently they occur alone. Their clinical history is characteristic ; it is slow in its progress, apyretic in character, and sooner or later produces albuminuria and dropsy."[*]

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* 'Jones and Sieveking's Pathological Anatomy,' by Payne, 1875, p. 502.

† Ibid.

‡ 'Pulmonary Consumption,' by Drs C. J. B. and C. Theodore Williams, 1871, p. 37.

Dr Pollock states that "*Bronchitis* is a less common origin of fibroid changes, but it is observed in children and others; in the former after pertussis or rubeola, when collapse of a portion of lung is apt to occur, followed by contractile fibroid proliferation."[†] Acute bronchitis in children frequently causes dilatation of the bronchi, both in the idiopathic form of the disease, and also in the course of measles and whooping-cough.[‡]

This sequence of events looks very much like the blood having also undergone some important changes. Rokitansky calls it a *fibrinous crasis* or a peculiar state of the blood in certain cases, rendering the products of inflammation more fibrinous than corpuscular; more fibroid or contractile tissue is produced, and less of the purulent and opaque curdy deposit.[§] There may be differences of opinion as to the manner in which the disease originates, but the tendency is to cause contraction and induration of the texture in which the morbid matter is deposited, and sometimes to be followed by caseation and cavities in the lungs. The bronchial tubes also become dilated or contracted according to the part of the lung which is chiefly affected. When the lower part is invaded the air cannot get beyond the larger tubes, and so the pressure of the inspired air dilates them; while at the upper part the tubes are contracted from the shrinking of the lung towards the spinal column, the collapsed state of the chest wall, and the displacement of the heart upwards.

When phthisis is chronic, and is seen in connection with tubercle and with fibroid tissue, it is termed "mixed phthisis."[‖] The presence of tubercle in the affected lung cannot always be discovered; the disease is sometimes acute, and involves the whole of a lung, while in another it is more partial and chronic. It is difficult, if not impossible, to frame definitions which shall include all these varieties. After all, they are merely different stages of the same morbid process varying in extent and degree.

The *constitutional* symptoms of phthisis vary as we have seen according to the particular type of the affection. The acute forms are rapid in their progress, the chronic are slow and insidious. In acute phthisis the temperature usually runs high; in chronic phthisis it may be subnormal in the daytime. Any degree of mischief in the lungs is compatible with a normal temperature. The pulse is habitually quick in acute phthisis, ranging from 100 to 140; in chronic phthisis it sometimes does not exceed the normal rate. The respiration varies according to the extent of lung involved. In the early stages it may be calm and regular, but when the disease is extensive or it is of the acute form, the breathing is generally rapid. In chronic phthisis the symptoms of ill health are frequently overlooked till attention is invited to the chest, and then the presence of physical signs, with cough, loss of flesh, quick pulse, and elevation of temperature in the evening clear up any doubts that may have previously existed.

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[*] 'Prefatory Note on Phthisical Lesions of the Lungs,' by Sir Andrew Clark, 1877.

[†] "Clinical Demonstrations of Phthisis," 'The Lancet,' 1876, vol. ii, p. 566.

[‡] 'Reynolds' System of Medicine,' Article "Chronic Pneumonia," vol. iii, p. 756.

[§] 'Pulmonary Consumption,' by Drs C. J. B. and C. Theodore Williams, 1871, p. 63.

[‖] 'Jones and Sieveking's Pathological Anatomy,' by Payne, 1875, p. 504.

Hæmoptysis is not frequent among children as a symptom of phthisis. Still it does occur now and then, especially where tubercular or pneumonic consolidation is breaking down. In an early stage it is due to active hyperæmia, to an undue determination of blood to the congested mucous membrane, and not to venous obstruction. In advanced phthisis it arises from aneurismal dilatation of branches of the pulmonary artery being ruptured, and is rarely bronchial, whereas in early phthisis it is generally bronchial.* In broncho-pneumonia and whooping-cough a little blood is frequently coughed up from over-distension or fragility of the capillaries, and the patient is none the worse for it. I have known a child, 3½ years of age, born of consumptive parents, and suffering from tuberculosis, bring up at one time a teaspoonful of blood, a year before any other chest symptoms were noticed. This hæmorrhage was then followed by loss of flesh, intense thirst, and febrile exacerbations towards evening. Small mucous râles were detected over the front of the chest and below the spine of the right scapula, which area was also dull on percussion. There was harassing cough, and thick sputa were coughed up, occasionally tinged with blood. Hæmorrhage from the lung would seem to have been the starting point in this case—the real cause of the lung destruction. Hæmoptysis is less copious in the first than in the third stage of the disease. Dr Douglas Powell has recorded a fatal case in an infant, seven months old, the subject of tuberculosis. Five other children of the same family had all died consumptive, the father had chest disease, and the grandfather died of phthisis at thirty-three. The infant, who had not had any previous attack of hæmoptysis, suddenly expectorated more than half a pint of dark, partially clotted blood, and died almost immediately. On a post-mortem examination the surfaces of both lungs were studded with subpleural grey miliary granulations of tubercle, and the lungs, on section, were also found to be disseminated with similar granulations.* It has been stated in corroboration of Niemeyer's view, that in severe hæmoptysis portions of blood are drawn into the alveoli which they occupy as fibrinous nodules, and that these may set up irritation, produce a calcareous mass, or even cause laceration of the pulmonary tissue and cavities.†

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* Dobell, op. cit., p 20.

The recent discovery of the bacillus tuberculosis in the sputa has afforded us another diagnostic symptom—for instance Dr Theodore Williams examined the sputa of 130 patients at the Brompton Hospital, with a view to determine whether the tubercle bacillus was always present in phthisis. "Twenty-one patients were examples of various lung affections other than phthisis; two were cases of asthma, five of emphysema, two of bronchitis and emphysema, three of bronchitis, one of pleurisy, three of bronchiectasis, one of pneumonia, one of empyema, two of pulmonary congestion (the result of heart disease), and one was an obscure case of lung induration. In no one of these did the sputum contain bacilli. The 109 phthisical cases consisted of acute and chronic forms, and included instances of tuberculo-pneumonic phthisis, of scrofulous pneumonia, of fibroid, catarrhal phthisis, and a large number of cases of chronic tubercular phthisis. Cavities were detected in one or both lungs in 81 of these patients, nine were in the stage of early consolidation, the rest were undergoing softening or were cases of old tubercular induration, with emphysema and fibrosis. In the 109 phthisical cases bacilli were detected in 106—that is, in all but three, and even of these three in one it could not be affirmed with certainty that they were absent."‡ Dr Williams justly states that the absence of the tubercle bacillus in the cases of bronchiectasis, in which the expectoration was both fœtid and abundant, separates it from those organisms which are connected with fermentation and decomposition. Further, it should be observed that the bacillus is not limited to those cases of phthisis in which there is softening and excavation, but it is also met with in cases of early consolidation, when the deposit of tubercle is going on. This is contrary to the experience of some observers. When the disease is active and the expectoration copious, the bacilli are generally most abundant, and where the disease is quiescent, they are few, but there is nothing definite in this respect. It is now conclusively proved that the breath of consumptives contains bacilli, and that, in the course of a day, an immense number are given off into the atmosphere. If the bacillus is the agent of infection, it is remarkable that there should be so few cases contracted in this way. It may be as Dr Theodore Williams says, that the bacillus requires a congenial soil to thrive in, and that this is to be found in all those persons who have been exposed to the usual predisposing causes of consumption, as heredity, bad food, imperfect ventilation, damp soil, unhealthy occupation, &c. Congestion and low inflammatory processes take place, unhealthy exudations are formed, cells form actively, and instead of growing into healthy tissue, die and caseate, and so cavities are formed. Those who are strong and vigorous may defy these organisms, but the weak and delicate succumb.

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* 'Path. Trans.,' 1874, p. 40.

† "Pathological Traces of Pulmonary Hæmorrhage," by Reginald E. Thompson, M.D., 'Med.-Chir. Trans.,' vol. lxi, p. 261.

‡ 'The Lancet,' Feb. 24th, 1883, p. 312.

The investigations of Dr Percy Kidd on the "Distribution of the 'Tubercle-Bacilli' in the Lesions of Phthisis" are very similar. This concurrent testimony adds great weight to the importance of Koch's discovery. Of 80 cases examined by Dr Kidd, in more than half of which the lung was examined, bacilli were invariably found in pulmonary cavities, and in nearly all cases in softening caseous material associated with a tuberculous affection. The fœtid contents of cavities, in the cases of sacculated bronchiectasis, contained numerous micrococci but no tubercle-bacilli. In caseous pneumonia, where the caseation was firm and uniform, no bacilli could be detected, but where softening was going on, there bacilli could often be found in great numbers.* This, however, as we have already seen, is contrary to the experience of Sir Andrew Clark.†

It is not yet decided whether the bacillus can be detected at the earliest stage of tubercular disease, which is a point of the greatest importance, but it is certain from Dr Whipham's case that it may be absent when the disease is arrested or improving.* Bacilli have been found in small numbers in the nodular lesions of phthisis, and very abundantly in acute miliary tuberculosis.†

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* 'Med.-Chir. Trans.,' 1884.

† See Chap. XXXVIII on "Tuberculosis," p. 447.

The *physical* signs of phthisis ought to be carefully studied, because they throw light upon the general symptoms of the disease, and strengthen our diagnosis, when the indications afforded by either alone might leave us uncertain. Phthisis is both a constitutional and a local malady—constitutional in the sense that it has a preliminary stage, if I may so term it, and the patient may be consumptive without any tubercle in the lung. The local change, when it does ensue, is the effect of the constitutional taint. Many children present all the general characteristics of pulmonary consumption, wasting of flesh, quick pulse, and harassing cough, and yet the chest affords no evidence of disease, the resonance is not impaired, the breathing is clear.

I have before said that tubercle tends to diffusion in young subjects rather than to concentrate itself on the apices of the lungs, as it does in adults. Still we occasionally encounter cases in young subjects where the morbid changes do not extend to the base of the lungs, or if tubercle is scattered extensively through them, it mainly involves the upper lobes, and softening takes place before the patient has lived long enough for the like destruction to ensue in the lower lobes.

We shall speak of three stages of the disease:

1. That of deposit.
2. That of consolidation and softening.
3. That of suppuration, when cavities form.

Space will not admit of fully considering all the signs which various authorities have from time to time held to indicate consumption. I am bound to admit that my own experience concurs with those who are unable to declare whether mere feebleness or harshness of breathing, imperfect expansion of the chest, loudness of the heart's sounds, or bronchophony, are, any one of them, taken singly, reliable indications of tubercular disease. I think not.

Although it is important to examine the chest carefully throughout both in front and behind, the upper portions of the lung above and below the clavicles, and the supra-scapular spaces, should never be overlooked. The inter-scapular region too often affords evidence of enlarged bronchial glands, which may serve to clear up any doubt.

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* "The Relation of Bacilli to Tuberculosis," 'Med. Soc. Proceedings,' 1883

† 'Brit. Med. Journ.,' Dec. 13th, 1884, p. 1193.

First stage.—Looking at ordinary cases as we meet with them in practice, the earliest indications of a deposit of tubercle in the pulmonary tissue are an alteration in the breath-sounds; the inspiratory murmur is weak, harsh, jerking, or bronchial, and the expiration (which is far more significant) is loud and unduly prolonged. Mere weakness of breathing does not go far as a diagnostic sign, as it occurs in many cases of general debility, and disappears with improved health. It may arise in consequence of a narrowing or obstruction of the bronchioles, pleuritic effusion, thickening of the pleura, and emphysema, which impair the elasticity of the lungs.* A comparison of the two sides of the chest is the only test of its quality, since it is very rare to find both lungs similarly involved.

Harshness of breathing is another sound at variance with the softness of health, and when also rough or blowing it passes into bronchial breathing with moist sounds. It arises from thickening and loss of elasticity in the air-cells, and also from a dry condition of the bronchial membrane.

When there is a change in the quality of the breathing, and the expiration is prolonged, it may be considered to indicate commencing mischief. In some states of debility among children, and in bronchitis and emphysema, audibility and lengthening of the expiratory murmur are not uncommon. This is very apparent in thin exhausted subjects, when they allow the air to escape from the lung by a sudden or spasmodic effort, as they often will do when the chest is being examined. We have all observed in practice how short the inspiration is, compared to expiration, in fat and feeble subjects, when the heart is weak, and the patients are breathless from flatulence or exertion.

Jerking, wavy, or *interrupted* respiration is only valuable as a means of diagnosis when taken in connection with other signs. Alone it is unimportant.

Changes in the form and movements of the thoracic walls are worthy of careful observation, as throwing much light on the condition of the lung. When the patient is placed in a suitable position, and the hand is laid over the sternum during inspiration, a comparison of the two sides can easily be made, and any inequality of expansion is detected through the amount of tubercular deposit. The other retrogressive changes are the sinking-in of the thoracic walls, the cup-shaped depression below the clavicle, the rounded shoulders, the bent form, the contracted chest, and the distorted spine.

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* "Clinical Demonstrations of Phthisis," by J. D. Pollock, M.D., 'The Lancet,' vol. ii, 1876, p. 179.

Dulness on percussion is another diagnostic sign on which great reliance has been placed, and it sometimes comes to our aid; but it is not always present, as I have pointed out in enumerating the physical signs of tuberculosis. There may be considerable tubercular deposit scattered through the pulmonary tissue without causing any dulness whatever. Still in that variety of phthisis, in which there is a localised deposit of tubercle in the apex of a lung, there is diminished resonance, or heightened pitch.

Vocal fremitus is another physical sign to be remembered. It is dependent on the extent of pulmonary condensation beneath the thoracic walls, but it is not always present, and even when it is there are usually other signs of more significant import. Children's chest walls are thin, and the normal vibrations are readily conveyed through them; fremitus, therefore, is often present when there is no disease. If the amount of vocal fremitus is equal in both infra-clavicular regions, the left side is *probably* diseased, and if greater on the left than the opposite it is *almost certainly* so. With regard to bronchophony, which is a more valuable sign, a similar conclusion may be drawn. If it is equal in both infra-clavicular regions, the left is *probably* morbid, and if there be a decided excess on the left side it is *almost certainly* so. An excess of vocal resonance on the right side is no proof of tubercular deposit, although if very highly marked it is a suspicious symptom.* Undue propagation of the heart's sounds, subclavian or pulmonary murmurs, are all signs of some assistance in suspected tubercular consolidation.

Moist sounds heard at the apex of a lung at the seat of tubercular deposit are very significant. There is a sound called *dry crackling rhonchus*, which is regarded as conclusive evidence of tubercle. It is a dry and crackling sound, generally heard during inspiration, and indicates an advanced condition of the *first* stage. These crackles are at most three or four in number, and are produced external to the air-cells; they are not always heard, and they are succeeded by a moist kind of crackling. The sound is not unlike subcrepitant rhonchus, which is, however, moist and bubbling, and can scarcely be mistaken for it. Subcrepitant rhonchus however, succeeds it, and if heard at the apex is very significant, although if bronchitis be present it may be heard at the base also. This sound passes into humid crackling. If there is dry cough, a little flocculent expectoration, with febrile symptoms and any loss of flesh, the early stage of phthisis is confirmed. Dr Pollock has known the stage of deposit to remain quiescent over and over again for fifteen or twenty years.*

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* 'Phthisis and the Stethoscope,' by R. Payne Cotton, M.D., 1864, p. 35.

If phthisis is the consequence of bronchitis, the signs of the latter disease are increased, rhonchus of a sonorous or sibilant character is heard below the clavicles and over the greater part of the sternum, as well as between the scapulæ. If these sounds are persistent, and are more heard at the upper portions of the lungs than at the lower, they are suspicious of early phthisis, especially if the resonance on percussion is impaired in places. If also subcrepitant rhonchus accompanies the expiratory as well as the inspiratory murmur (which, according to Dr Williams, the crepitation of pneumonia never does), then this view is the more suspicious.†

Crepitation is a sign of obstruction to the entrance of air into the pulmonary tissue in consequence of swelling, or the presence of secretion in the air-cells. When phthisis is the result of acute pneumonia, the dulness on percussion continues, and there are bronchophony and tubular breath-sounds. After a time this chronic consolidation undergoes change into fibroid or caseous matter, in the one case contracting, and in the other breaking down into one large cavity, or several small cavities.

Second stage.—The physical signs announcing the commencement of the *second* stage, or that of softened tubercle, are much the same as those already described. Seeing that the first stage may continue for an indefinite time, it is difficult to draw the exact line of demarcation between them. A tubercular mass may reach a considerable size in one case, and produce extensive disease of the lung and pleura before it begins to soften, whilst in another case degeneration takes place in the mass at an early period. A very important sign of this stage, particularly if it is at all advanced, is increased dulness on percussion of the affected side, and the note has sometimes that particular jarring hard dull sound which is termed "*wooden*." It is not a frequent sound. It seems to be produced only when consolidated lung is bound to the thoracic wall by thickened pleura.

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* Op. cit., p. 179.

† 'Pulmonary Consumption,' 1875, p. 169.

There is another sound, called *humid crackling* rhonchus, which may or may not be preceded by *dry* crackling. It consists of a few moist, large, clear, abrupt, clicking sounds, of varying intensity, generally during inspiration, but they may be heard during expiration also, masking both acts; this clicking is also due to softened tubercle—to destruction of lung tissue, and when once heard cannot well be confounded with subcrepitant rhonchus, which is of a bubbling character; and if the two sounds are present at the same time, which is possible if there is congestion or inflammation around the softened lung, the distinction between them is all the easier. This click in the course of time becomes louder, moister, and more or less *metallic*, subsequently passing into the third stage, or that of gurgling rhonchus. When the clicks are slow and few, and occur at intervals, the mischief in the lung proceeds much slower than when they are large, metallic, mucous, and loose.

In this stage there is often wasting and loss of flesh.

As we have seen, there is a difficulty in separating the first from the second stage of phthisis, so there is an equal difficulty in defining the termination of the second stage and the commencement of the third.

Third stage.—This is reached when a vomica, however small, is present. Now, the clavicle on the affected side is more prominent, and the hollow beneath it is deeper and more cup-shaped towards its acromial end. On deep inspiration the lower part of the chest wall is elevated, suddenly raised, as it were, by the contraction of the diaphragm; the forced muscles of inspiration come into play, whilst the upper part of the sternum is barely expanded at all, and the hand may not be elevated on the deepest inspiration.

Gurgling rhonchus is a moist, large, bubbling, metallic sound, heard during the act of inspiration and expiration when the cavity is small. It is the final stage of the humid crackling and large subcrepitant rhonchus which have been already explained. The percussion sound is necessarily subject to great variation, according to the state of the lung, the adhesions that have been formed, the force employed in striking the thoracic wall, and the size of the cavity. The note, from being absolutely dull or "*wooden*" is sometimes scarcely altered from that of health. I have known the infra-clavicular region of a child approach healthy resonance, when the sounds elicited by auscultation and the depressed and inactive state of the chest wall have confirmed the last stage of phthisis. When the vomica is large, and situated near the chest wall, or only separated from it by thickened pleura or lung, the percussion note has a peculiar hollow-like resonance, which has acquired the expressive term *amphoric*. When this sound is present, a modification of it, called the *cracked-pot sound* (*bruit de pot fêlé*), first described by Laennec, may sometimes be heard, if the chest over a cavity is struck suddenly, rather forcibly and abruptly, whilst the patient's mouth is kept open. Dr Cotton remarks that the natural percussion sound in children suffering from bronchitis or emphysema, or even when in perfect health bears a close resemblance to the cracked-pot sound, and therefore in patients under ten or at most twelve years of age, this sign is of no value in diagnosis, unless it is accompanied by other evidences of a vomica,* and unless it contrasts strongly with the other side of the chest.

A cavity may form so gradually in the lung, and the process of disintegration may be so slow as to escape notice, till the character of the breathing helps to decide the doubtful point.

When there is a cavity in the lung, the expiration may assume a hollow, blowing, metallic quality, termed *cavernous*; and if the cavity is large it may possess an amphoric quality. Cavernous respiration is not unlike bronchial respiration, but the latter is heard over a greater extent of lung, it is rougher in quality, and is wanting in the metallic type so characteristic of the former. If a cavity contains much purulent matter, or the bronchial tubes opening into it are clogged up, and the patient is very feeble, it may escape notice altogether. The gurgling rhonchus, too, when it is large or bubbling, according to the amount of secretion, may also obliterate the cavernous character of the breathing. Coughing will often throw much light upon obscure symptoms. A vomica in young children is by no means easy to detect, as the natural respiration is usually so blowing over the whole chest that the cavernous character is completely masked at any particular spot. Percussion and auscultation are also at their minimum in these young patients.*

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* 'Phthisis and the Stethoscope,' 1864, p. 72.

Metallic tinkling is sometimes heard when the vomica is very large and contains fluid; but I never remember to have seen an instance in a child, owing perhaps to the rarity in them of tubercular excavation. Pectoriloquy, for the like reason, is not a frequent sign.

Elastic tissue is sometimes detected in the expectoration of phthisical persons who have cavities in their lungs, but it is not always found. The best method of proceeding is to boil the sputa with a solution of caustic soda, and then to examine the deposit under the microscope.

Phthisical laryngitis.—When the laryngeal mucous membrane is ulcerated, the respiration over the trachea is harsh and loud, and the voice is changed to a whisper in some cases. With these symptoms those of ordinary phthisis are generally present.

Causes.—These are *predisposing* and *exciting*. Among the former the tubercular or phthisical diathesis is to be noticed, with its light hair and eyes, fair skin, long eyelashes, and thin lips; so that, looking at the matter from a hereditary point of view, we know when a child has inherited a scrofulous constitution or has come of tuberculous parents; the disease under these circumstances is readily lighted up on slight provocation. Residence on a wet soil, or in badly-ventilated homes may induce it. The mortality is high among those who reside on a heavy clay soil, whilst the deaths are rare on a light and gravel soil. Over-exertion of the mind or any depressing circumstances predispose to the affection. Among the *exciting* causes are previous inflammation of the lungs, frequent catarrh, broncho-pneumonia, hereditary syphilis, and prolonged anæmia. A low diet, imperfect digestion, and depriving delicate children of fatty constituents of food, are among the most common causes. Exhausting illnesses of any kind may invite phthisis, especially measles and whooping-cough. It may follow strumous disease of a joint, or an empyema (p. 409), owing to the absorption of infective matters.

It is a remarkable circumstance that phthisis is not found in certain countries and localities. Dr Leared says that in Iceland it does not exist, the atmosphere is cold and clear, and the inhabited parts are not much above the level of the sea. In Morocco, where there is also no phthisis, the atmosphere is the reverse of Iceland, and the soil is sandy; there is also no phthisis in the valley of the Jordan, which is eighty to ninety feet below the level of the Mediterranean, and the atmosphere of these three places is totally different from that of Davos.* Dr J. H. Bennett also remarks that the inhabitants of Iceland, living in a most unhygienic state, filthy in person and habits, and cooped up in badly ventilated huts, are said to be all free from consumption, and from other forms of tubercular disease. A fact which he connects with their great consumption of oil as an article of diet.†

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* Ibid, p. 84.

Diagnosis.—Acute phthisis (acute tuberculosis) may be mistaken for typhoid fever or meningitis as mentioned (see pages 427—428—467). The chief diagnostic differences from typhoid fever are the natural form of the abdomen, the absence of rose spots and gurgling in the right iliac fossa, constipation rather than diarrhœa. Then, too, cough, livid countenance and dyspnœa, point to the chest as the source of mischief. That form of acute phthisis known as "galloping consumption" which commences with pneumonia can hardly be distinguished from that disease at an early stage, but in place of the fine crepitant rhonchus there is coarse crepitation, sometimes amounting to gurgling, and the symptoms are more persistent; the pulse and respiration keep frequent, the wasting of flesh is rapid, and there is sweating at night.

Treatment.—In considering the treatment of tuberculosis and the arrest or absorption of tubercle, we must, in a measure, disregard the varied and special symptoms of the disease, and sustain the general strength. The nutritive functions being primarily at fault demand the closest attention, and whatever conduces to their healthy performance holds out the best means of controlling morbid action, and of averting the tendency to local congestion and exudation; for when these changes have occurred, the molecules or granular matter of which the exudation consists are liable to softening and disintegration.

As cases of tuberculosis differ like other forms of consumptive disease, remedies of a varied character are required. In some children the temperature of the body is high at an early stage of the illness, and the circulation is accelerated; there is thirst and derangement of the gastro-intestinal tract, and food is not digested, even if there is any remnant of appetite left. Antiphlogistic measures and cooling drinks to subdue this febrile excitement are absolutely required. We have seen how frequently bronchitis or pneumonia is associated with this condition, and when they are met with, salines and diaphoretics are required before supporting measures can be safely employed. When moist sounds in the chest have succeeded to dry rhonchus or tubular breathing, we may commence the system of treatment which modern practice has sanctioned, and give cod-liver oil and mild tonics during the daytime. In the evening, when febrile symptoms are chiefly observed, citrate of potash and the alkaline carbonates will abate the excitement, and soon enable us to give quinine safely in small or large doses so as to check the febrile exacerbations. For children I am in the habit of giving a grain of quinine in powder half an hour before going to bed, and sponging the body lightly with tepid water, if hot and dry, or with cold water if the temperature is disposed to rise rapidly.

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* 'Med. Soc. Proc.,' vol. iv, p. 259.

† 'Nutrition in Health and Disease,' 1876, p. 93.

Cod-liver oil is the most effectual remedy of all others in the management of this disorder, and may be given when febrile excitement has not departed. Dr Williams says, "Cod-liver oil, when taken into the system in sufficient quantities, and for a sufficient length of time, acts as a nutrient, not only adding to the fat of the body, but also promoting the healthy growth of the protoplasm and the tissue-cells, and in some way, as an alterative, counteracting the morbid tendency to the proliferation of the decaying cells of pus, tubercle, and kindred cacoplastic and aplastic matters."*

When the oil is pale and pure it seldom causes nausea or disturbs the functions of the liver. I prefer giving it after a meal in a little orange wine, or with a small quantity of milk, which, however, does not always agree. Dr Williams gives it with a mild acid as the nitric, hydrochloric, sulphuric, or phosphoric according to the special circumstances of each case, and in combination with quinine, steel, or some aromatic bitter I can speak most favorably. I have been in the habit of giving the hydrochloric acid before the meal, and the oil afterwards. In weakness of the stomach, with a tendency to retching and nausea, the $\frac{1}{24}$th or $\frac{1}{32}$nd of a grain of strychnia may be given with each dose of oil. But it must have come within the experience of every one that cod-liver oil, when long continued, is apt to disagree with the stomach, and to cause biliary derangement, particularly if the diet is not carefully regulated. Here it must be suspended for a time, and an alterative and alkaline treatment employed, till digestion is restored to a healthy state. In the winter season of the year cod-liver oil is an indispensable remedy, and may be continued for months together. But, however combined, the daily use of the oil has superseded every remedy that has hitherto been proposed, and there is not a physician in this country or abroad who is not convinced of its efficacy, both in prolonging life, and in curing disease.

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* Op. cit., 1871, p. 322.

Whilst we are giving astringents to check diarrhœa, and sedatives to relieve cough, we are diminishing the strength and appetite, and the disease meanwhile advances. The best means of relieving these symptoms is to increase the general strength, by supplying the system with fatty elements in a form that can be easily assimilated. We have found this remedy in cod-liver oil. The molecular fluid of the chyle consists of fatty particles, from which the blood and tissues of the body are formed, and if chylification is imperfect or tardy, the blood is watery and albuminous, and thus exudation is favoured. Physiology never exposed a greater therapeutic error than when it showed the danger of treating low inflammatory exudation by depressing the vital powers so that its molecules were incapable of passing through those transformations which lead to growth and elimination. By an opposite mode of treatment depraved nutrition is restored, the respiratory organs are stimulated to active exertion, and the tissues attract from a better quality of blood the necessary elements for the support of the body.

The hypophosphites of lime and soda with strychnia, iron, and quinine, form an excellent combination, and in all states of general debility and nervous exhaustion.

In the case of an infant, if the mother is delicate, or comes of a consumptive stock, and cannot suckle her child, a healthy nurse should be procured. Older children who exhibit a tendency to tuberculosis should wear flannel next the skin; the diet should be plain and nutritious, consisting of eggs and milk, and meat twice a day if the child can digest it.

Quinine, by improving the strength and appetite, and iron, by altering the quality of the blood, are two most valuable remedies when the digestive functions have been brought into a proper state, and there is no risk of renewing inflammation in the pulmonary organs. If there is any degree of febrile excitement or cough, it is preferable to omit the iron till it is reduced, and direct the treatment to special symptoms. The effect of quinine in non-tuberculous cases is very remarkable in controlling the remissions and exacerbations of the fever; it is the most valuable remedy we possess, and in cases of oscillating temperature which I have treated it has been followed by a fall. Where the fever has not so quickly yielded the lung has shown evidence of some change, in the shape of small and localised pneumonia, or there has been cause to suspect real tuberculosis. Cod-liver oil should always be given in the daytime, when the temperature is normal, and quinine in the evening, before the rise is expected.

When we encounter phthisis in the first or incipient stage, we should aim at improving the general health by placing the patient under the most favorable circumstances for controlling inflammation and promoting the absorption of any low organised deposit that may have taken place. For this purpose, whatever encourages local inflammation and congestion, such as cold, damp, and exposure, should be dealt with. Flannel should be worn next the skin, and the feet especially kept warm. Congestion may be relieved by the application, night and morning, of diluted tincture of iodine (one in four) to that part of the chest which gives evidence of localised mischief. When there is bronchial irritation and cough, a turpentine liniment, or camphor liniment containing croton oil, is one of the best and most serviceable applications. The remaining treatment of this stage consists in providing the patient with pure air and a sea-side residence, if possible, such as St Leonards, Torquay, Ventnor, Bournemouth, or Clifton in this country, or the South of France, and the healthiest parts of the Mediterranean abroad. Sponging with sea water followed by friction will be necessary, and such exercise as the strength is equal to endure.

Children affected with consumption should not sleep with other children, or occupy the same room at night.

In phthisis we have to deal with a low form of cell growth, which has a decided tendency to spread. Our energies then have to be directed to this condition, and this essentially depends upon the improvement of tissue nutrition, for these two things are requisite—first, the arrest of all outgoings, which impoverish the system, and second, to improve the assimilation. To attain the first object it is necessary to arrest the night sweats, and to hold in check the diarrhœa. Where both exist, sulphate of copper is most useful, and it is often well to give opium with it. Where there are profuse sweats without diarrhœa, belladonna is our sheet anchor. According to Heidenhaim, belladonna paralyses the secretory nerve-endings of the sudoriparous glands. Children tolerate belladonna much better than adults, and no serious toxic symptoms need be apprehended from anything like medicinal doses.* It is well to sometimes prescribe belladonna in the form of its active agent atropine. As sulphate of atropia, belladonna can be given in precise doses, while it has the great advantage of being tasteless. Children will tolerate doses commencing with gr. $\frac{1}{80}$th at bedtime, while doses of gr. $\frac{1}{75}$th three times a day never give real cause for anxiety. The failure of belladonna may usually be traced to insufficiency of the dose. In the very rare cases where belladonna fails, oxide of zinc, with hyoscyamus may be resorted to. Gallic acid, quinine, dilute sulphuric acid, and the tincture of the perchloride of iron are all useful remedies to arrest night perspiration. When any of these remedies, and full doses of belladonna, fail to arrest the night sweats, then it becomes necessary to sponge the child over with toilet vinegar, or with warm vinegar and capsicum (a teaspoonful of cayenne pepper to the half-pint of vinegar diluted with water) about half an hour before the usual time when the sweats become profuse. The arrest of the loss of blood-salts in the sweats usually leads to improvement in the appetite. The next point then is to improve the assimilative process. It is useless to give tonics and hæmatics as long as the digestion is out of order. If the tongue be foul, an occasional dose of calomel at bedtime, with a little phosphoric acid and a vegetable bitter three times a day, is indicated. When the tongue is raw or bare, or denuded of epithelium, bismuth with an alkali is called for. When the appetite has returned and the digestive organs are fairly working, then, and not till then, tonics and hæmatics may be prescribed.

Dr McCall Anderson has recorded two interesting cases of acute phthisis in young subjects, which yielded to the treatment employed, the temperature falling in both instances from 105° to the normal point in the course of a few days; the copious râles disappearing, the appetite returning, and loss of flesh and strength being rapidly regained. To control the high-fever, he applied to the abdomen folded pieces of flannel wrung out of iced water for half an hour at a time, and gave quinine, opium, and digitalis internally. For the profuse perspiration he had recourse to the subcutaneous injection of gr. $\frac{1}{100}$th of sulphate of atropia every night, which entirely arrested it after the second night. When the injection was omitted the sweating returned, and again subsided on resuming it. Nourishment in the shape of brandy, soup, and iced milk were given every hour.*

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* See Chap. XXI, p. 344.

If the pulmonary condition is tolerably quiescent, the syrup of the iodide of iron, the syrup of phosphate of iron, and the mineral acids will be demanded. Cod-liver oil, or malt extract, if there is wasting. When the disease has passed into the second stage, or that of suppuration, we must employ such remedies as relieve cough and facilitate expectoration. If the patient is very weak, and the lung has broken down, the accumulation of matter in a cavity is attended with most distressing symptoms, weight and pain in the chest, gasping respiration, incessant cough, wandering, sleeplessness, and excitement. The inhalation of carbolic acid by means of the spray (1 in 40) will sometimes relieve this, but it often fails, and then it is necessary to resort to an emetic of sulphate of zinc—about ten grains in a tablespoonful of water, followed by a little warm water, will effect this purpose. In a girl 14 years of age, under my care in 1869, with a large cavity in the upper lobe of the left lung, I found this act remarkably well. It never occasioned hæmoptysis, of which there is a dread, but enabled the poor child to throw off a large quantity of pus from her chest, followed by great comfort and relief in breathing.

Cough is a prominent symptom of phthisis, which always calls for attention. If it is loose and moderate, and the child can obtain a fair amount of rest, special remedies to check it are hardly needed; if given they are apt to impair the appetite, to derange digestion, and to lock up secretion. There are similar drawbacks to bromide of potassium, though to a less extent, but if the child is kept awake at night it becomes exhausted, and then the simplest remedies should be first tried, as poppy and squill.* If the cough is hard and violent, with scarcely any expectoration, and there is vomiting also, morphia and hydrocyanic acid may be needed;† when it comes on in convulsive paroxysms, belladonna, stramonium, &c. If the tongue is furred, the throat irritable, and there is any amount of bronchitis, chlorate of potash, with syrup of tolu and morphia, may be required,‡ and if the expectoration is difficult, ipecacuanha or squill may be given, according to circumstances.§ Where there is great sleeplessness, hydrate of chloral, with bromide of potassium in syrup of tolu, or squill, may sometimes be given with advantage. Where the respiration is accelerated because the lung space is infringed upon, the administration of distinctly depressing remedies is fraught with danger of paralysing the respiratory efforts.

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* "On Acute Phthisis" (Galloping Consumption), 'The Lancet,' 1877, vol. i, pp. 413—415.

In the treatment of *hæmoptysis* we must be guided by the amount of blood lost. If small in quantity, perfect rest should be maintained, ice to suck, and the avoidance of all stimulants may be enough to check it, but if there be any considerable loss, and the lung is breaking down, or there is a cavity, some styptic remedy must be employed at regular intervals. Dr C. J. B. Williams speaks highly of gallic acid with acid tartrate of potash. Tannic acid and gallic acid combined, acetate of lead, ergot and tincture of perchloride of iron, are all useful in special cases. The diet should consist of milk, cold beef tea, broth, &c. It is important to keep the bowels well open, and for this purpose sulphate of magnesia and sulphuric acid, in infusion of roses, is a good formula. When the hæmoptysis has ceased, cod-liver oil, and other tonics can be resumed.

Diarrhœa is another complication of phthisis tending to produce great exhaustion and emaciation. When persistent it may depend upon ulceration of the intestine. It is a symptom that must be combated at once by remedies of a suitable character. If the tongue is coated, and there is impaired digestion or unhealthy fæces, a few grains of grey powdar with rhubarb will be needed, and when the secretions are corrected, one of the diarrhœa formulæ will be useful.[*] Those containing bismuth, logwood, krameria, sulphate of copper and opium, acetate of lead, &c., are the best. Opiate enemata must be had recourse to in severe cases, and fomentation and poultices may be required if there is abdominal pain and tenderness. The diet should consist of rice, milk, arrowroot, &c.

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* *Form.* 74:
℞ Syr. Papav.
— Scillæ
— Limonum ãã ʒss.
M. ʒj pro re nata.

† *Form.* 75:
℞ Morph. Acet. gr. ¼
Acid. Hydrocy. Dil. ♏xvj
Glycerini ʒij
Aquam ad ℥iss.
M. ʒj pro re nata.

‡ *Form.* 76:
℞ Potass. Chlorat. ʒss
Liquor. Morph. Hydrochlor. ♏xx
Syr. Tolutani ʒvj
Aquam ad ℥ij.
M. ʒj pro re nata.

§ *Form.* 77:
℞ Liquor. Morph. Hydrochlor. ♏xx
Vin. Ipecac. ʒj
Oxymellis Scillæ
Syr. Mori ãã ʒss
Mist. Acaciæ ad ℥ij.
M. ʒj pro re nata.

These prescriptions are intended for children from five to ten years of age.

The hypophosphites of lime and soda are highly spoken of by some authorities. They are especially recommended by Dr Thorowgood. In many cases under his care unmistakeable good came of their administration, when other well-devised means of cure had proved useless.[†] He gives instances in which "night-sweats" and fever gradually disappeared, and moist sounds in the lungs ceased under their administration. In a few cases cavities contracted and became drier. Some of the patients when seen months afterwards appeared well. Dr Thorowgood advises the hypophosphite of *soda* when there is a tendency to gastric irritation, and the lime salt in cases of diarrhœa. To the former a few grains of bicarbonate of soda may often be advantageously added. When there is slight congestion at the apex of the lung, and there is crackling or clicking it may be used, but if dyspepsia or bronchitis from recent cold is present, it should be temporarily exchanged for other remedies. In the early or incipient stage, when there is localised dulness, with harsh or tubular breathing, or even when crackling announces that the lung is congested or giving way, he has found them of great value. He gives the hypophosphite of soda or lime, in infusion of calumba, three times a day.[‡] It may be combined with bark[§] or some of the preparations of iron.[*] The hypophosphites are well spoken of in combination with cod-liver oil, phosphoric acid, quinine and glycerine by Dr C. J. B. Williams.[†] Strychnia, with the oil, is the best tonic for strengthening the stomach and preventing nausea, it aids digestive power, and in combination with the compound orange infusion is very effectual, and not unpleasant to take.[‡]

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[*] See Chap. XIII, "On Diarrhœa," p. 153.

[†] 'On Consumption and its Treatment by the Hypophosphites,' 3rd edit., 1880.

[‡] Form. 78:
℞ Sodæ Hypophosphitis ʒss
Syr. Aurant. ʒiij
Inf. Calumbæ ad ℥vj.
M. A tablespoonful three times a day.

[§] Form. 79:
℞ Sodæ hypophosphitis ʒss
Syrupi ʒiij
Inf. Cinch. Flav. ad ℥vj.
M. A tablespoonful to be taken three times a day.

For children ten years of age and upwards.

Antiseptic Inhalations.—If the air passages and the expectoration are invaded by bacilli, it is supposed by many observers that their destruction may arrest the disease in its early stages. The specific virus by exciting inflammatory action destroys the lung tissue, and hence it is that dry pure air, mountain air, the vapour of iodine, creosote, carbolic acid, &c., kill these organisms. To arrest the disease at its onset is a different thing from bringing about a cure when the lung has broken down and cavities have formed, but even here inhalation affords relief. The substances used for inhalation should vary according to the circumstances of the case, and be changed from time to time. Several inhalations are in vogue. Five minims of liquefied carbolic acid should be dropped on the sponge, in the centre of the respirator, or the same quantity of creosote, oil of eucalyptus, spirit of turpentine, tincture of benzoin, or tincture of iodine are the best substances for inhalation. In most cases an equal quantity of spirit of chloroform should be mixed with whatever substance is selected. The antiseptic employed should not be made stronger than is comfortable to the patient. Where there is any tendency to hæmorrhage or profuse secretion turpentine is useful. Great relief, and very striking improvement in most cases of pulmonary phthisis follow these antiseptic measures, when combined with constitutional treatment. They relieve cough, soothe the irritable mucous membrane, and promote sleep.

An excellent "antiseptic respirator" is manufactured by Messrs.

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[*] Form. 80:
℞ Tinct. Ferri Perchl. ʒj
Calcis Hypophosphitis ʒss
Glycerini ʒiij
Aquæ ad ℥vj.
M. A tablespoonful three times a day.

[†] Form. 81:
℞ Sodæ Hypophosphitis ʒss
Acid. Phosph. Dil. ʒij
Tinct. Quiniæ
Glycerini āā ℥ss
Inf. Aurant Co. ad ℥vj.
M. A tablespoonful three times a day with one teaspoonful of cod-liver oil.

For children ten years of age and upwards.

[‡] 'Pulmonary Consumption,' by C. J. B. and C. Theodore Williams, M.D., 1871. p. 359.

Squire, at the suggestion of Dr Burney Yeo. It is made of zinc, perforated with a number of holes, and can be bent to suit the mouth and nose. In the centre of the respirator is a bit of sponge, on which the substance for inhalation is dropped. The sponge can be taken out and washed from time to time, and be replaced by another piece, or by cotton wool. The two elastic strings are to be passed round the ears, or fastened at the back of the head, so as to keep the respirator in its proper place.

CHAPTER XL

DISEASES OF THE HEART

FUNCTIONAL DISEASES OF THE HEART.—PALPITATION.—DEFINITION AND SYMPTOMS.—*Causes—Graves' disease—Chorea*—SYNCOPE OR FAINTING.—NEUROSAL AFFECTIONS.—*Causes, symptoms, and treatment.*

ORGANIC OR STRUCTURAL DISEASES OF THE HEART.—PERICARDITIS.—*Two varieties described—Acute and chronic—Symptoms, general and physical—Delirium—Mode of termination—Diagnosis—Morbid anatomy.*—CAUSES.—*Acute rheumatism—Extension of pneumonia or pleurisy—Renal disease—Chorea—Scarlatina.*—TREATMENT.—*Local and general means—Venæsection—Leeching—Blisters—Mercury—Opium—Stimulants.*—CHRONIC PERICARDITIS.—*Causes—Symptoms—Consequences—Treatment.*—HYDROPERICARDIUM.—*Active and passive—Local and constitutional signs—Treatment by purgatives—Diuretics and tapping.*—ENDOCARDITIS.—CAUSES—*Acute rheumatism—Scarlet fever—Bright's disease.*—SYMPTOMS AND DIAGNOSIS—*Relation to pericarditis—Pathological changes—Liability to terminate in valvular disease and embolism*—TREATMENT—*Importance of ascertaining the cause and regulating the treatment accordingly—Perfect rest in bed to lower blood pressure and excitement of the circulation—Use of hydrate of chloral.*—MYOCARDITIS—*Occurs sometimes with endocarditis, scarlet fever, and typhoid fever.*—ULCERATIVE ENDOCARDITIS (Kirke).—DIPHTHERITIC ENDOCARDITIS (Rosenstein).—INFECTING ENDOCARDITIS (Cayley).—*Pathology—Diagnosis—Causes and treatment.*

VALVULAR DISEASE OF THE HEART.—*General symptoms—Disease of the aortic valves—Aortic regurgitation—Disease of the right auriculo-ventricular orifice—Tricuspid regurgitation—General and physical signs—Venous pulsation—Liability* *to anasarca and dropsy—Disease of the pulmonary valves* (Peacock)—*Disease of the left auriculo-ventricular orifice* (*mitral regurgitation*) — *Chiefly in girls—Symptoms and consequences of mitral disease—Congestion of lungs in—Character of the pulse—Obstructive disease* (*narrowing*) *of mitral orifice* (*mitral stenosis*) *state of the pulmonary circulation—Presystolic murmur—How produced and its importance as a diagnostic sign—Pathological anatomy of the diseased orifices and valves—Common causes of valvular disease, especially rheumatism—General treatment and management—Effects of digitalis in—Iron—Strychnia—Association with rickets* (Rokitansky, Hilton Fagge), *distortion of thorax—Heart cough.*—HYPERTROPHY AND DILATATION.—*Causes due to obstructed circulation — General and physical signs — Character of apex beat and pulse—Area of cardiac dulness increased—masked by emphysematous lung — Hypertrophy of right ventricle and dilatation—Epigastric pulsation—Hypertrophy and dilatation from chronic kidney disease—Treatment.*

MALFORMATION OF THE HEART.—4 *Principal varieties—symptoms—Cyanosis—Terminations—Treatment.*

IN children, owing to the thinness of the chest walls, the impulse of the heart is diffused over a larger space than in adults; not unfrequently a part of the right ventricle may be detected beating immediately under the left costal cartilages close to the sternum. The apex may also be seen, as well as felt, in the normal position. When the intercostal spaces are depressed, and the ribs prominent at their attachment to the sternum, the partial outline of the heart becomes all the more distinct. The shape of the chest, whether natural, rickety, or pigeon-breasted, will influence the area of percussion dulness, and the extent of the cardiac movement perceptible beneath the thoracic parietes.

The size of the heart does not increase with absolute regularity in childhood, for Rilliet and Barthez have shown that between the age of fifteen months and five years and a half, its circumference remains nearly the same, increasing slowly afterwards until puberty.

FUNCTIONAL DISEASES OF THE HEART

Palpitation.—We understand by palpitation a frequent and tumultuous action of the heart, not usually accompanied by organic disease, though it is sometimes present in valvular affections. On placing the hand over the cardiac region, a sudden and violent thumping movement is appreciable, and the heart's action can be seen beneath the chest wall. The sounds are exaggerated, and there is sometimes a soft bruit which vanishes when the organ resumes its ordinary tranquility. When the disorder is well pronounced, there is considerable constitutional excitement, quick pulse, headache, and a tendency to syncope. The female sex is more liable to it than the male. As growths proceeds, and the health remains delicate, continued palpitation of the heart may induce hypertrophy or dilatation.

The *causes* of this functional disorder are the nervous temperament, running after meals, violent exercise, mental emotion, anger, fear, &c. It is often witnessed among choreic children, and those reduced by chronic or lingering disease, loss of blood, dyspepsia, and pulmonary affections. In Graves' disease (exophthalmia) the anæmic condition is accompanied by palpitation of the heart and throbbing of the arteries.

The *diagnosis* mainly rests on the absence of the signs of organic disease, and the frequency of the pulse, followed by steadiness and regularity as the attack subsides.

The *treatment* consists in the removal of the cause if this can be done, and the improvement of the digestive and nervous functions. Where there is dyspepsia, an alkali with hydrocyanic acid will calm the excitement, and afterwards the ammonio-citrate of iron with a drop or two of liquor strychniæ, according to age, may be given with advantage. The emplastrum belladonnæ may be applied over the cardiac region if there be pain there. When the symptoms persist, the main hope of relief depends on an improved state of the blood, and attention to hygienic rules.

Syncope or fainting is occasionally observed in children of nervous constitution. A peculiar sensation is first experienced of dizziness and swimming before the eyes, and singing noises in the ears. Then the face and lips become pale, the skin clammy, and the pulse at the wrist so weak that it is barely perceptible. The patient if unsupported falls to the ground, and the breathing is hardly distinguishable. This alarms friends and bystanders, for the pallor of the face is death-like, the muscles are relaxed, and the extremities are cold. By and bye, if the recumbent posture is maintained, a few deep sighs are drawn, and as respiration is established the natural colour of the face returns. Mild cases do not last over a few seconds, and the pulse is only slow and weak; but severe cases continue for some minutes, and the patient no sooner shows signs of rallying than in attempting to stand up, the syncope returns at once, the eyelids quiver, and drops of sweat stand upon the forehead.

The *causes* are loss of blood, or even the sight of it, in some nervous constitutions, profuse diarrhœa, extreme fatigue, severe pain, and affections of the heart. Sudden shock, or even excitement are also capable of producing the symptoms.

Treatment.—The recumbent posture should be maintained, and a current of fresh air admitted; ammonia to the nostrils, sprinkling cold water over the face, loosening all dress, and friction of the limbs. When the patient can swallow, a little brandy and water, or a draught containing ammonia, with spirit of chloroform should be given. If the vapour of ammonia be applied to the nostrils it should be done with care.

Neurosal affections.—These consist of a neurosis of the cardiac ganglia, inducing functional disturbance in the heart's action. This neurosis is, I believe, a very common disorder among delicate children. When they cry on slight provocation, and are restless and excitable, a careful examination of the heart and circulation will often throw light upon an obscure set of symptoms. I have elsewhere fully entered into this subject.* The complaint is observed in weak and delicate children, and in those who suffer from chorea, or nervous states resembling it. Children who are born prematurely, and who are badly reared and neglected during the first year of life are liable to it as they approach seven or eight years of age, particularly if the strain of school life is put upon them too early. General debility from any cause, such as anæmia and loss of blood, by disturbing the equanimity of the nervous system, will cause perverted nerve action. It may follow whooping-cough, chronic enlargement of the tonsils, or chronic pneumonia. The offspring of nervous or insane parents are also subject to it.

The *symptoms* are, palpitation of the heart, followed by faintness and exhaustion. If the hand be placed over the cardiac region a thumping violent movement is communicated to it, accompanied by irregularity, or intermission of the pulse. This symptom is always a sign of imperfect muscular action through the quality of the blood and the unstaple condition of the nervous system. Sleep is unrefreshing, and restless or noisy; dreaming is common; and the urine often contains phosphates.

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* 'Neurosal Affections of the Heart in Children," 'Practitioner,' Sept.,' 1878.

The *treatment* which is almost invariably found successful consists in the employment of rest and tonics, good food, cod-liver oil, and warm clothing. Steel wine and arsenic (Form. 93), quinine, the syrup of phosphate of iron, and ferrum dialysatum (dialysed iron), and Parrish's chemical food are valuable remedies in particular cases; but I place the greatest confidence in a combination of iron, digitalis, and strychnia. If there be excitement, and sleep cannot be obtained, iron may be combined with the bromide of potassium.

ORGANIC OR STRUCTURAL DISEASES OF THE HEART

Pericarditis.—Two varieties of pericarditis are commonly described, the acute and chronic. Inflammation of the pericardium consists in the first instance of distension of the capillaries, and secondly of effusion of serum or lymph exuding from them; and in some cases, as absorption of the fluid proceeds it ends in the glueing of the two surfaces of the pericardium together. The character of the exudation is in a great measure dependent upon the constitutional condition of the patient.

The *general* symptoms of acute pericarditis are more or less pain in the præcordial region at the situation of the apex, or at the lower end of the sternum; it may strike through the thorax to the scapula, or extend down the left arm to the elbow and wrist. The pain in most acute cases is of a sharp, lancinating character, and is aggravated at each shallow inspiration, or movement of the patient. He cannot turn on his side, or bear the slightest pressure over the thorax; even the weight of the bed clothes is oppressive. Sometimes the pain is of a dull aching continuous character, or it is too slight to attract notice; in many instances it is absent altogether, if there be no pleurisy, and the physician might overlook pericardial mischief, if the anxious and alarmed expression of the patient did not invite a close inspection of the thoracic contents. The anxiety of expression, moreover, is frequently noticeable before there are any reliable physical signs to indicate a lesion in the pericardium. Palpitation and irregular action of the heart are by no means infrequently added to the pain as the disease proceeds.

Pleurisy is sometimes associated with pericarditis, and may even originate the latter affection by extension.[*] Endocarditis is frequently present, the two diseases being in close relationship with one another, and arising from precisely the came causes.

Pericarditis sometimes commences with convulsions succeeded by fever, and a full, hard, and frequent pulse,—in some cases it is small, unequal, or irregular. As effusion takes place there are dyspnœa, hurried respiration, great restlessness and insomnia. The pulse and respiration increase in frequency with the intensity of the disease; but later on, as the effusion lessens, both become slower. The commencement of the disorder may be marked by heat of skin, but this is soon bathed in perspiration, and the face becomes pinched and intensely anxious. As exhaustion proceeds, and the circulation is more embarrassed, there is delirium, and abrupt sleep disturbed by dreams. In severe cases the child has the expression of alarm and dread, he cannot lie easy in any position, and is afraid of being examined or approached. When the disease is about to terminate fatally, clammy sweats break out, the face becomes livid, and the eyes are staring and glassy.

The effusion fills the pericardial sac in about three days, and in six days more it generally returns to its healthy amount.

Physical signs.—The characteristic auscultatory sign which renders the diagnosis unmistakable is a to-and-fro sound (*bruit de frottement*). This is the earliest sign of pericarditis, which cannot be discovered unless the friction sound is produced. (The late Dr Hyde Salter, and Dr George Johnson, of King's College Hospital, insist that the friction sound is triple "rub-a-dub-dubb." There is first the auricular contraction, then the contraction of the ventricle, and lastly the dilatation of the ventricle in diastole.) This sound depends on the position of the exudation; if it cover the auricle there is decidedly auricular friction, such as Dr Johnson has described; if the lymph cover the ventricle only, the sound is simply to-and-fro. This sound is caused by the rubbing together of the inflamed surfaces of the pericardium, and a very good imitation of it may be obtained by applying one end of a stethoscope against the ear, and the other against the palm of the hand. The forefinger of one hand is then rubbed backwards and forwards across the hand so applied, when the peculiar friction sound will be transmitted through the stethoscope to the ear. The murmur caused by the attrition of the inflamed surface of the heart and pericardium closely resembles this. It varies necessarily in character and intensity according to the consistence of the effused lymph; if moderately thick it has a creaking character, like new leather (*bruit de cuir*) or a rasp-file like sound (*bruit de râpe*). When effusion takes place to such an extent that the two surfaces do not approximate, the murmur is generally, though not invariably, lost, and the heart's sounds are distant or muffled. When the friction murmur and the cardiac sounds both disappear, we may expect that the quantity of exudation is considerable. Important as this murmur is in a diagnostic point of view, we should err greatly if we supposed that its presence was necessary to the existence of pericarditis, for a large effusion may have taken place at a very early stage of the disease, and the sound will be absent till the effusion has become partially absorbed. The absence of the murmur altogether is quite compatible with severe inflammation of the pericardium. An endocardial murmur is also frequently heard (proving the implication of the endocardium) in the space midway between the left nipple and the sternum, which soon extends over the whole præcordial region. The exocardial murmur is distinguished by the superficial character of the sound, and by its limitation to the cardiac region, as well as by its change of character, and its temporary disappearance when the effusion is great. If the effusion is purely liquid it may be absorbed, but if it be more fibrinous and solid, the pericardium is thickened, and the opposed surfaces may become adherent. When exudation has taken place, the physical signs of pericarditis are increased dulness over the præcordial region, according to the extent of the effusion, or rather the area of diminished resonance is not increased, unless the effusion is considerable. The percussion dulness occurs chiefly at the base of the heart, where the pericardium is loose and most easily distensible. It may extend upwards to the second rib, and transversely from the right side of the sternum to the line of the left nipple. When the pericardial sac is distended to any extent the cardiac apex is pushed upwards and outwards. In the case of a boy, 7 years of age, with endocarditis and pericardial effusion, the apex beat was in the fourth interspace, an inch and a half external to the nipple line, and the endocardial murmur was very loud towards the left axillary region. In cases of this kind the heart's sounds are often feeble, distant, and indistinct.

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[*] Dr Sibson ascertained that in 31 out of 63 cases there was pain in the side; in 19 cases on the left side, to the right in 5, and in both sides in 6. In 15 out of the 31 cases a pleuritic friction sound was heard in the side.—"On Pericarditis," 'Reynolds' System of Medicine,' vol. iv, p. 232

Pericarditis may terminate in complete restoration to health where the effusion is serous and watery; but if lymph or solid fibrinous matter is thrown out into the pericardial sac it is likely to end in adhesion of the opposed surfaces, and lead to those general and physical signs recognised under the name of *chronic pericarditis*.

When the pericarditis has been of any considerable standing, the serum effused into the muscular tissue of the heart sometimes impairs its tone, and may give rise to a certain amount of dilatation. This passes away when the health has improved, and the cavities contract to their normal dimensions.

Diagnosis.—The diagnosis is easy enough if the case is well marked, and the effusion is serous and moderate in quantity. In such cases as these the patient may make a complete recovery, and be none the worse for the seizure. If the effusion is thick and fibrinous, as we have just seen, it may cause roughening, or adhesion of the surfaces. Delirium is an important diagnostic symptom, and when it occurs early in the disease it may lead to the false impression that the brain is the seat of the malady. When delirium supervenes in the course of rheumatic fever, it would be a culpable error not to investigate the condition of the heart carefully at every visit, exposing the patient, however, as little as possible. Orthopnœa is also an important diagnostic sign. The disease is very fatal in weak and strumous children.

Morbid Anatomy.—At an early stage, when the serous covering of the heart first becomes inflamed, a network of fine vessels appears, especially at the base about the coronary arteries and the ventricular septum. Similar fine vessels also appear on the inner surface of the pericardium, where it rubs against the heart. Inflammation having once arisen here, it extends through the serous membrane to the fibrous structure of the sac, and even to the pleura covering it. The normal smooth and glistening surface of the heart and pericardium become dull and velvety, followed by the exudation of fluid and lymph.

The effused serum is sometimes of a transparent lemon colour, or it is of a reddish tinge, or there is pus in the pericardium with coagulable lymph. The lymph so thrown out from the surface of the heart and pericardium assumes the shape of threads, ridges or prominences, where the opposed surfaces come in contact. It is owing to this alternate stretching and relaxation of the lymph that the two surfaces when torn asunder at this stage present a honeycombed, or tripe-like appearance. In many cases slight adhesions take place between the heart and pericardium where the movement is least, and this is between the sac and the apex, or between the sac and the right auricle. Under the constant oscillatory movement of the heart the adhesions usually yield and break away, but occasionally they become partially or universally permanent.[*] The white spots so constantly found on the surface of the heart after death, have been shown by Sir James Paget to arise from previous inflammation. But it should also be noticed that these white or milk-spots are very commonly seen on the anterior surface of a dilated heart as the consequence of friction.

Causes.—As an idiopathic affection, acute pericarditis is extremely rare; yet it does now and then occur, and may escape detection in the absence of pain about the heart. Even the most acute pain may be present in the cardiac region, with high fever, frequent pulse and respiration for some days before any physical signs are present to assist our diagnosis. I have recorded such a case in a boy eleven years of age. The pain ceased when the opposed surfaces of the heart and pericardium were kept asunder by the effusion. Recovery was perfect.[†] As an accompaniment of acute rheumatism, pericarditis is very common. It is by far the most frequent cause. "In five cases of pericarditis, in three of acute, and in four of chronic endocarditis, and in two more in which both the pericardium and endocardium were involved—making a total of thirteen out of thirty-nine cases, or exactly one in three, rheumatism was certainly known, or alleged on good grounds, to have been the starting-point of the mischief."[‡] "Of pericarditis not in alliance with rheumatism, Corvisart gives five cases, and it was complicated with inflammation of other parts in all of them except one, and in this it was caused by a severe blow upon the region of the heart."[*] It may arise from the extension of pleurisy or pneumonia, or be associated with renal disease, chorea, measles, or scarlatina. In acute Bright's disease from scarlet fever in the young pericarditis only occurred to one in fourteen, or 7 per cent., of the patients under 16 years of age.[†] Andral has met with it as a complication of smallpox, and in the last stages of tubercular disease of the lungs with vomicæ, and with chronic asthma and bronchial congestion. A case in which the pericardium was greatly inflamed, and contained an abundance of turbid yellow serum and lymph, is recorded by Dr Dyce Duckworth. The child was only eight months old, and the disease appeared to follow on enlargement of the bronchial and mesenteric glands. After death no tubercle was found in the pericardium or brain, but it was general in the pleuræ, lungs, liver, and spleen.[‡]

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[*] 'Collected Works of Francis Sibson, M.D.,' edited by W. Ord, M.D., 1881. Article, "Pericarditis," vol. iii, p. 284.

[†] 'The Lancet,' 1881, vol. ii, p. 85.

[‡] West on the 'Diseases of Infancy and Childhood,' 1859, p. 481.

"In 2 cases of pericarditis, in 3 of acute, and 1 of chronic endocarditis, or in 6 out of 39 instances, the disease of the heart was traced to an attack of scarlet fever. The cardiac symptoms did not manifest themselves in the acute stage of the affection, but during the process of desquamation. They were accompanied by fever and anasarca, which, however, did not exceed mere puffiness of the face and extremities, until, in the two instances of pericarditis, both of which ran a chronic course, dropsy came on as the consequence of the heart disease."—*Ibid.*

Treatment.—The objects to be aimed at are to reduce the inflammation and to favour the absorption of the effused fluid. Leeches may be applied to the cardiac region in strong subjects, and there can be no question of their service where the pain is very acute, and the pulse is frequent and hard; but venæsection is never necessary in children, however robust they may be, because reduction of the strength has to be feared, especially as the complaint frequently follows rheumatism, when the constitution already low will not bear further depression, and the blood in many instances is poor and aqueous. A strong mustard poultice is about the best application; its action is quick, it can be obtained at a moment's notice, and when the child complains of the smarting it may occasion, it can be removed at once. In cases of acute pericarditis accompanying rheumatic fever, in children, I have found these poultices act most beneficially, quickly relieving the præcordial distress and uneasiness, and I believe controlling the effusion. The chest should be covered with cotton wool immediately the poultice is removed.

The next remedy of service is counter irritation. I should not hesitate to employ a blister whilst the skin is reddened from the rubefacient effects of the mustard. The surface should be painted over with strong blistering fluid, and the chest protected afterwards with cotton wool. I have never known it do any harm, but the late Dr Sibson was opposed to blistering, on the ground that it inflicted local injury, tainted the blood by increasing its fibrin, and prolonged the inflammation. He strongly advocated the application of chloroform over the seat of suffering, combined with belladonna liniment, sprinkled on cotton wool, and covered with oiled silk.* After the action of the blister, an ointment composed of equal parts of savin and mercurial ointment should be spread on lint, and applied to the præcordial region. Another excellent application, after the blister has risen, is a combination of mercurial ointment and powdered opium (℥j ad ʒj) recommended many years ago by Dr Beale.

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[*] Dr P. M. Latham on 'Diseases of the Heart,' New Syd. Soc., 1876, vol. i, p. 219.

[†] *Sibson on Pericarditis*, 'Reynolds' System of Medicine,' vol. iv, p. 408.

[‡] 'Path. Transactions,' 1875, vol. xxvi, p. 246.

Hot fomentations are unsatisfactory, because they necessitate exposure of the patient's chest during their employment, and it is doubtful whether they can be borne hot enough to be of any benefit. Then there is the danger of getting a cold or chill, which ought to be guarded against, and so likely is this to happen that, if the case goes on satisfactorily, it is a great mistake to institute frequent stethoscopic examinations of the chest.

Mercury may be given as an aperient, but not with the view of fulfilling any special indications; and in rheumatic cases it requires great caution. If inflammatory fever runs high, and there is thirst, elevation of temperature, and scanty turbid urine, then a general antiphlogistic treatment may be carried out, and aperients, diuretics, nitrate and bicarbonate of potash will be required. Even aconite is sometimes useful, if the skin lacks moisture, and quinine may be given advantageously, in small doses, if the temperature is disposed to run high, and there are indications of exhaustion.

Opium, in the form of Dover's powder, should be employed if there is much pain, as the continuance of it further reduces the strength of the patient. Opium diminishes the cardiac contractions, and controls the hurried circulation; but if the heart gets feeble, the respiration hurried, and the countenance at all livid, then stimulants, in the form of wine or brandy, ammonia, or ether, will be required.

Chronic pericarditis is usually a sequel of an acute attack of rheumatic fever, and is not frequent in children. The chief symptoms are pain in the region of the heart, and inability to lie on the left side, or with the shoulders low. The changes produced in the pericardium where the acute attack has not ended in resolution, are thickening or adhesion of the pericardial surfaces, and effusion of lymph or pus. In consequence of this change the action of the heart is embarrassed, and the muscular structure of its walls becomes hypertrophied. When adhesion takes place, the action of the heart is rolling or tumbling, and it can be observed over a large space: the apex is seen beating in the epigastrium, which is retracted. With these changes the face is often dusky and anxious, and if with the acute pericardial attacks the endocardium has been also involved, we may have evidences of valvular disease.

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* Op. cit., p. 433.

The *treatment* consists in meeting the symptoms that arise, by blisters to the chest, active saline aperients to relieve the oppressed circulation, and antirheumatic remedies, as iron, quinine, and iodide of potassium.

Hydro-pericardium.—Pericardial effusion may be the result of acute or chronic pericarditis. The physical signs are a gradual increase in the transverse dulness just below the base of the heart, and displacement of the lungs. The dulness may extend across the thorax from the right nipple to the line of the left axilla, and as high up as the top of the sternum. In all effusions into the pericardium, however small or large, dulness extending upwards is the surest diagnostic sign from cardiac hypertrophy.

The amount of effusion by separating the heart from the chest wall causes its impulse to be weak, and bulging of the præcordia may ensue. The liver, spleen, and diaphragm are depressed. Adherent pericardium leads to dilatation and hypertrophy of the heart.

The symptoms in the case of a lad, aged 13, who came under my notice in 1864, were as follows:—The patient was suffering from rheumatic fever. On the fifth day of the attack, acute pericarditis came on, and four days later there were all the symptoms of extensive pericardial effusion. The patient had to be propped up in bed from the severity of the dyspnœa, and he could not lie down for a moment without threatening suffocation. The pulse, throughout small, became fluttering, and for some hours imperceptible at the wrist; the skin was bathed in sweat, low muttering delirium was frequent, and the patient's life was despaired of. The dulness extended nearly across the sternum from one nipple to the other, and as high as the second rib. The heart's action could not be detected, but there was no palpable prominence of the præcordial region. The patient recovered without any after bad effects, either local or constitutional.

The *treatment* consists in giving aperients and diuretics. Blisters and counter-irritants should be applied to the chest. When there is no chance of the effusion becoming absorbed, an aspirator should be passed through the fifth intercostal space, and some of the fluid drawn off.

An interesting case of pericardial effusion is recorded by Dr Barlow, in a boy six years of age. "Twice the pericardium was tapped by the aspirator, and twice the abdomen, with marked relief, and without any bad effects from the operation. The child was feverish throughout, and neither the fever nor the considerable ascites could be satisfactorily explained during life, but after death these were found to be due to tubercular peritonitis."[*]

The purely passive form of effusion from obstruction to the circulation presents the same symptoms, and the treatment is also similar.

A case of "Purulent Pericarditis" in a boy, sixteen years of age, is recorded by Dr Samuel West, in which paracentesis was twice performed and subsequently the pericardium was laid freely open. After evacuating the pus, the sac was washed out, and a drainage-tube inserted. The temperature never rose and the patient recovered in five weeks. The best spot for puncture in ordinary cases is the fifth left intercostal space, one inch from the edge of the sternum, and this may be done with a trochar and cannula, with or without aspiration. Purulent pericarditis should be treated like an empyema, and the results are far more favorable, seeing that the walls of the cavity contract more rapidly. Friction sound is generally absent, and in the present case this was owing to the smoothness of the pericardium, the large effusion, and the viscidity of the pus.[†]

Endocarditis.—This disease consists in inflammation of the endocardium or lining membrane of the heart, and is frequently associated with pericarditis as a consequence of acute rheumatism. It is most common in the latter affection, but it may arise from exposure to cold, be developed in the course of severe chorea, or scarlet fever, or measles, or smallpox. Bright's disease may induce a chronic form.

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[*] "On a Case of Pericardial Effusion, in which Paracentesis was performed," 'Practitioner,' 1873, vol. xi, p. 265.

[†] 'Proceedings of the Royal Medical and Chirurgical Society,' June, 1883.

The *general* symptoms of acute endocarditis are a sense of discomfort and uneasiness over the cardiac region, anxiety of expression, flushed countenance, and a tendency to syncope. Pain and tenderness are not present unless there be pericarditis or pleurisy. There is restlessness, hot skin, thirst and fever, followed by perspiration, which is often profuse as the disease advances; the pulse soon becomes quick, feeble, or intermittent, and the breathing is hurried and abdominal. As the disease progresses the lips become livid, the eyes are dim, and the face is dull and heavy, or pale and shrunken. Wandering at night, and even delirium and convulsions, are among the symptoms. Bronchial congestion, or pulmonary engorgement is apt to ensue from increasing debility, and failure of the circulation through the lungs.

It is to be borne in mind that the symptoms are not so invariably acute as those just described. Endocarditis in a young child may arise and pursue its course without fever, or any special symptoms.* The approach of the disease is sometimes so gradual and mild that we should not suspect its existence unless the stethoscope was employed. In acute rheumatism (with which the disease is commonly associated) the possibility of this dangerous complication should not be overlooked in the absence of urgent symptoms.

The *physical* signs are those indicating mischief at the aortic and mitral orifices, as mentioned under valvular affections; there is usually a soft bruit at the apex with the systole, but the symptoms depend on the valves which are affected, and these are generally on the left side of the heart. Now and then a double murmur may attend both systole and diastole. The disease may terminate fatally from exhaustion and cerebral symptoms, or, if the acute stage be passed over, no traces of the disease may remain. In most severe cases valvular changes ensue, leading to puckering of the valves and impairment of their functions, with ultimate obstruction of the circulation and general dropsy. A portion of coagula may be detached from the curtain of the inflamed valve and carried into the general circulation, causing embolism.

In endocarditis as the accompaniment of rheumatic fever there is an inflammation of the lining membrane of the heart. Effusion of lymph into the structure of the valves (*mitral valvulitis*) ensues, which finally becomes converted into a fibrous structure, the chordæ tendineæ are involved, so that they undergo contraction, and the valves becoming tied down or puckered up together, which either narrows the mitral orifice (*mitral stenosis*) or the opening is so wide that when the ventricle contracts regurgitation is produced (*mitral regurgitation*). The mitral valve at each ventricular contraction has to sustain much greater pressure than the aortic valve, which has only to bear the force of the returning blood against it.

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* 'Lettsomian Lectures,' by E. Sansom, M.D., 1883.

Treatment.—This should in some measure depend upon the disease with which the cardiac affection is complicated, and seeing that it may arise in the course of acute rheumatism or scarlet fever, it will be important to modify the treatment accordingly. The treatment is really that of pericarditis, with which it is often associated, but there is this difference, endocarditis speedily tends to exhaustion, and is not so amenable to active agents. "This fact, then, is ascertained and confirmed by experience, viz. that the damage done to the endocardium by rheumatic inflammation may abide for four or five years without producing any conscious detriment to the health or well-being of the patient, or (as far as we have the means of judging) any farther injury to the structure of the heart. And it is a most important and consolatory fact. But in other instances other results immediately follow. When after its departure acute rheumatism leaves the endocardial murmur behind it, which, though known only to the physician, is the sure sign of injury done to the endocardium, it leaves it attended from the beginning by other symptoms, which the patient is sufficiently conscious of, and these are directly referable to the heart. They consist of palpitation, and some pains, and some dyspnœa, which are not constantly present, but only under bodily exertion and mental excitement. The child who has had the præcordial murmur ever since it suffered a certain rheumatic attack, is just the same child as it was before, except that it cannot join in any pastime requiring rapid movement; for then its heart palpitates, it loses its breath, and is obliged to sit down."*

After an attack of pericarditis and endocarditis the most perfect rest should be maintained for several weeks. The patient should remain in bed for a length of time after the acute stage has passed so that excitement may be diminished, and the effects of strain should be kept off the injured valves by lowering the blood pressure as far as possible. Thick lymph has been thrown out, the muscular structure of the heart is weakened, and the cavities are dilated. Complete rest affords the best chance of recovery from the mischief which has been sustained. By moderating the heart's action the products of inflammation are more likely to be removed, whereas if they remain they may cause puckering and contraction of the valves and tissues, to which I have just alluded, and so interrupt the course of the circulation. Rest in the recumbent posture and avoidance of all exertion should be carefully observed, and on no account should the child be allowed to put his feet to the ground. An attempt to walk too soon accelerates the action of the heart, and further weakens it. Indigestible food has a similar effect. Iron to restore the muscular structure is the best tonic, and belladonna and digitalis to strengthen and steady the cardiac muscle at the same time are clearly indicated.

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* Dr P. M. Latham, 'On Diseases of the Heart,' New Syd. Soc., 1876, vol. i, p. 279.

Myocarditis or inflammation of the heart's substance is generally found in connection with endocarditis or pericarditis, but the muscular structure of the heart may be affected just as the muscles are in subacute or chronic rheumatism, without any inflammation whatever. Myocarditis occurs also in scarlet fever and in typhoid fever. After some fatal cases of endocarditis, the walls of the heart have been found to be thickened, and abscesses of variable size have been discovered in the muscular structure of the organ. Such changes sometimes occur in death from pyæmia, scarlet fever, and some other forms of blood-poisoning. If palpitation and violent pains in the cardiac region come on during rheumatism, and the pain extends through the shoulder, or passes down the arm, the disease may be suspected. The complaint being obscure in its manifestations, the treatment must be regulated in accordance with the most urgent symptoms and the cause in operation, if it can be discovered.

Ulcerative endocarditis.—This disorder superficially resembles the form of endocarditis, frequent in rheumatic subjects, where minute coagula form around endocardial vegetations, and becoming detached, produce embolism in the cerebral and other arteries. But in ulcerative endocarditis the blood is previously poisoned by some specific affection, as smallpox, pyæmia, diphtheria, &c., and coagula of infected blood form around the cardiac valves. Portions of these clots becoming detached, produce embolism of an infective character over and above their purely mechanical effects. The disease attacks only persons of bad constitution.

For much of the description now about to be given, I am indebted to an interesting lecture by Dr Cayley, on a case of "*Ulce-*

rative or infective endocarditis simulating typhoid fever in a boy aged nine years."[*]

The disease is to be distinguished anatomically by a large number of embolisms in the miliary form. The emboli in ordinary endocarditis are lodged in the middle cerebral artery, producing hæmorrhage and softening of the corpus striatum and optic thalami, followed by hemiplegia. In ulcerative endocarditis they are deposited in the pia mater of the hemispheres, and do not necessarily produce any cerebral lesion. The intestine is frequently the seat of emboli in this form of endocarditis, and in both varieties the kidneys and spleen are the most common seats of embolism. The endocarditis of acute rheumatism may occasionally assume this variety, and it may even supervene on chronic valvular disease.[†]

The *general* symptoms sometimes resemble ordinary pyæmia; there are rigors, high fever of a remittent or intermittent type, and local suppurations. In other cases they resemble typhoid fever, as in the case recorded by Dr Cayley.

In the typhoid form there are rigors and vomiting, often sweating, and irregular febrile exacerbations. There are also brown tongue, sordes on the teeth, and delirium passing into coma. The urine is often bloody and albuminous.

Auscultation discovers the signs of valvular obstruction, the murmurs varying according to the orifices affected, and the progress of the ulceration.

The disease tends to a fatal termination, and is not controlled by treatment.

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[*] 'Medical Times and Gazette,' Nov. 10, 1877, p. 509.

A case in a boy, æt. 14, terminated fatally, through rupture of the heart, almost immediately after admission into hospital. A year previously he had an attack of rheumatic fever, and since then had been losing flesh, and suffered from dyspnœa on exertion. A fortnight before admission he had severe pain in the chest, constant dyspnœa, and general malaise. When admitted there was a thrill, a double murmur, over the aortic valves, and a systolic murmur at the apex. "He suddenly became insensible, flushed in the face, and began to struggle, and then turned deadly pale and died." A post-mortem examination showed that "the pericardium was full of coagulated blood, which had flowed from a very small orifice in a sac lying between the aorta and pulmonary vein, and which was formed by the protrusion of the part lying at the base of the mitral valve, in which destructive inflammatory ulceration had produced the lesion."—*St George's Hosp. Rep.*, 1874-76, p. 367.

[†] The average weight of the spleen in ten cases of ulcerative endocarditis occurring 1867-70 was 25 oz.; they were always more or less soft and pulpy. Very rarely the en reaches even to double the latter weight in endocarditis."—*Path. Anatomy*, by ks and Moxon, 1875, p. 475.

VALVULAR DISEASES OF THE HEART

The general symptoms of valvular disease of the heart may be thus briefly stated. The blood is either impeded in its passage through the organ, or it regurgitates from defect in the closure of the valves, and this leads to hypertrophy with congestion of the lungs and other organs, followed by dropsy. The symptoms vary a good deal, and in children, even when the valvular condition and hypertrophy appear to be about equal, the constitution suffers differently. This arises from the conservative process of hypertrophy, which, for a long time, keeps in check the symptoms; but, by-and-by, the heart labouring to empty its overplus, fails, and congestion of the venous system follows. Then ensue hurried respiration, dyspnœa, pain in the region of the heart or palpitation, anxiety of expression, pallor or suffusion of the face, inability to walk upstairs, and the impossibility of resting in the recumbent position. The symptoms are increased by indigestion or mental emotion. The valves on the *left* side of the heart are far more prone to disease than those on the *right*. When the latter are affected it has been attributed to fœtal endocarditis.

The constitutional symptoms in these cases are liable to considerable variation. Some children who have all the physical signs of a severely damaged valve, as the consequence of rheumatic endocarditis, experience no breathlessness, and scarcely any other discomfort. They may go on for months or years with very little complaint. I have more than once known the heart entirely overlooked in these cases, and the symptoms of impaired health ascribed to weakness and general debility. But later on, the symptoms of obstruction *to* the circulation begin to be manifest, and there are cough, congestion of the lungs, and hurried breathing. In prolonged cases, the liver and digestive organs become deranged, the features are swelled, and œdema of the extremities supervene.

Disease of the aortic valves is so rare in childhood that it might be passed over unnoticed. But, since it does now and then occur in children, it is well to call attention to this lesion. When the aortic orifice is narrowed or constricted (*aortic obstruction—aortic stenosis*), the blood is impeded in its passage from the left ventricle. Over the mid-sternum, but more especially over the second right costal cartilage, and in the course of the aorta and carotids a soft systolic murmur, corresponding in time with the pulse, is heard, diminishing in intensity towards the apex. A systolic thrill is often felt over the cardiac region, at the right base, with heaving impulse. There is usually great hypertrophy of the left ventricle. If the heart's action is weak, and the narrowing of the orifice smooth, the murmur may not be easily detected. When the narrowing is great, the pulse is small and feeble, but this will in some degree depend upon the amount of hypertrophy present, which modifies its character. The constitutional symptoms are pallor of the countenance, and often headache from cerebral anæmia, owing to the unfilled state of the arteries. Unless the mitral valve becomes involved, so as to allow of regurgitation taking place, the pulmonary circulation is not interfered with.

Causes.—These are most probably due to chronic valvulitis, and to endocarditis after rheumatic fever. When rheumatic endocarditis happens, the inflammation begins in the mitral valve, and then, after involving the ventricular endocardium, seizes upon the aortic valves. The form assumed by aortic valvulitis in childhood is certainly that of regurgitation, the distortion and mutilation of the valves commences in the free edges, and is usually accompanied by dilatation of the aortic conus, and the actual enlargement of the aortic ostium.

When the aortic valves cannot effectually close the orifice on the aortic recoil, the blood stream returns into the ventricle, and *aortic regurgitation* is produced. The physical signs are a diastolic murmur heard at the mid-sternum obliterating the second sound, and frequently distinctly audible at the apex. It may be soft or rough, weak or loud, musical or prolonged. The pulse is sudden and jerking ; it is known as "Corrigan's pulse," collapsing, "like balls of blood shot under the fingers," but there may be considerable regurgitation without this being marked, or any visible pulsation in the superficial vessels.

The tendency of the disease is to produce extreme hypertrophy of the left ventricle, but very rarely any dropsy. The ventricle being always too full of blood undergoes comparative hypertrophy and containing blood in diastole, dilatation is added to hypertrophy.

Dr de Havilland Hall afforded me an opportunity in 1881 of seeing a patient of his, a boy ten years of age, who was the subject of aortic regurgitation. Six weeks before he came under observation he had complained of pains in his knees and feet, and had been confined to bed one week. When seen he was suffering from weakness and giddiness, and some shortness of breath on exertion. On examination, he was found to have a soft aortic diastolic murmur, heard loudest over the third right interspace close to the sternum, and conducted along the sternum to the apex. The impulse was greatly diffused, but most marked in the fifth interspace in the nipple line. There was visible pulsation in the brachial arteries.

Causes.—This affection may possibly be congenital. It may also follow chronic changes, violent strains, and endocarditis after rheumatism in obstructive disease.

Disease of the right auriculo-ventricular orifice (tricuspid regurgitation) is rare, and murmurs are uncommon in this situation, except in long-standing cases of mitral disease, in which the right side of the heart has become weakened, and there is obstruction to the pulmonary circulation. "Mitral stenosis is the most frequent cause of serious tricuspid regurgitation, and the earlier in life the stenosis occurs, the more rapidly, as a rule, the tricuspid regurgitation follows, and the more serious the prognosis."* The physical signs are increased præcordial dulness to the right of the sternum, at the level of the fourth rib, and epigastric pulsation, the ventricle being seen and felt between the ensiform cartilage and receding ribs in the left hypochondrium. Owing to the accumulation of blood in the right ventricle from congestion of the lungs, it becomes enlarged and dilated. As it encroaches on the position of the left ventricle, and lies in front of it, the apex is pushed away from the chest wall, and the impulse is extremely weak or cannot be felt at all. A murmur usually accompanies the systole, and is most audible over the lower part of the sternum, or ensiform cartilage. I say usually, because the murmur is altogether absent in some cases, and in others it cannot be detected, though the other signs of tricuspid incompetency are all present. Accentuation of the pulmonary second sound should be looked for, and weakness of the aortic second. The increased outline can often be distinguished readily enough in children, whose chest walls are thin, and the left lobe of the liver may receive an impulse, while at the same time the liver is not unfrequently enlarged. This condition is often attended with over-fulness of the cervical veins, because the right auricle is over distended, and in fact the right side of the heart altogether undergoes passive dilatation. The tricuspid being insufficient, each contraction of the right ventricle drives backwards the blood into the right auricle, and the veins in communication with it.

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* Balfour, op. cit., p. 181.

The wavy pulsation in the external jugular veins is an indication of considerable tricuspid regurgitation, but if the orifice is only slightly contracted then the valve may act efficiently, and the pulsation in the vein be absent. Congestion of the intestinal veins, scanty urine, and even hæmorrhoids are sometimes present. In a boy, aged eleven years, under my care in 1877, for mitral and tricuspid disease, œdema and anasarca of the lower extremities came on a month before death.

When the cardiac enlargement exists to the same extent in two separate cases, we may have in one case regular bowels and normal extremities, with the power to lie down and assume any position; whilst in another case there are severe and continuous congestive headache, enlarged veins in the neck, and pulmonary engorgement. This depends upon the amount of injury the valve has sustained. If the tricuspid orifice is only partially constricted, and there is no defect in the valves, the venous circulation is partially congested; for it should be held in mind that a murmur in this situation, like a mitral regurgitant murmur, may be simply the expression of great debility.

A systolic murmur heard most distinctly over the pulmonary orifice is generally due to anæmia, or to pressure by consolidated lung. When organic it is almost always congenital.

Disease of the left auriculo-ventricular (mitral) valve, causing regurgitation from the ventricle into the auricle, is the most common form of cardiac disease to be met with. It is evidenced by a murmur, diastolic in time, and unlike that of mitral stenosis is not caused by the contraction of the auricle. It is very much more frequent in girls than boys. In these cases there is enlargement of the left ventricle, and the apex beat is below and external to the nipple; it often occupies a larger space than in health, except when it strikes directly behind a rib, and then it is not detected so readily. The impulse is considerable and heaving, and if the hand be placed over the præcordial region, there is an appreciable thrill. Over the apex is a bruit accompanying the systole, partially obscuring the first sound and diminishing, or even disappearing at the base, if only slight; but if loud or intense, it may almost obliterate the second sound at the apex and be detected over the whole præcordial region. The murmur is synchronous with the pulse, and owing to the blood being carried back into the left auricle, can be heard in the left axilla, at the angle of the scapula on the same side, and at the spinal column. The pulmonary second sound is generally intensified. This murmur (*bruit de soufflet*) is soft and bellows-like in recent cases, where possibly the deposit on the valve has become highly organised, but in more advanced cases it is rough and grating, and resembles the sawing of wood. The peculiar vibratory motion (purring tremor—*frémissement cataire*) occasionally found in disease of the mitral orifice is essentially connected with obstructive, and rarely if ever with mitral regurgitant disease. Cough, congestion of the lungs, quick breathing, and a small contracted pulse, are common in these cases.

A loud apex murmur in mitral disease is compatible with fair strength and growth, and may be present without impairing the functions of the heart. In such cases there is probably a mere roughening of the surface of the valves, or even a vegetation, which does not permit any of the blood in the ventricle to flow back through the mitral orifice, yet a systolic apex bruit may be present and regurgitation take place with a competent mitral valve. "In fact, the mitral valve may be perfectly free from disease, and the auriculo-ventricular opening perfectly natural and undilated, and yet regurgitation may and often does take place."* In anæmia and chlorosis, a venous murmur may sometimes be heard over the mitral area, accompanied with accentuation of the pulmonary second sound, as in true mitral constriction and regurgitation, but unassociated with any valvular lesion. There are other cases in which the physical signs are the same, but graver mischief has been done, and the right side of the heart and lungs suffer in time. Children so affected are small, dwarfed and stunted, and liable to die of dropsy at puberty. They rarely get over the pubertal changes.

In certain rickety children with thoracic deformity, and twisting aorta, hypertrophy of the left ventricle is early developed (Rokitansky), and in some cases even valvular disease (Hilton Fagge).

Disease of he left auriculo-ventricular orifice (*obstructive disease*), *causing contraction of the orifice* (*mitral stenosis*) *and obstruction to the blood-flow into the ventricle.* This is a most rare disease in very young children. It seldom, if ever, occurs under five years of age. In this disease congestion of the lungs, hæmoptysis, or pulmonary hæmorrhage may ensue. The effects on the circulation are much the same as in the former case. Chronic bronchitis, pneumonia, and urgent dyspnœa, general venous congestion, and anasarca must be looked for. After a time the embarrassed pulmonary circulation affects the right side of the heart, and its cavities become enlarged; there is increased dulness to the right side of the sternum, and the right ventricle may be seen and felt between the ensiform cartilage, and the receding ribs to the left hypochrondrium in long-standing cases.

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* 'Diseases of the Heart,' Balfour, 1876, p. 102.

Some cases of mitral constriction are supposed to be of congenital origin, and they continue for years without causing any sign of heart mischief.

The pathognomonic physical sign of obstructive disease of the mitral valve is a presystolic murmur (*auricular systolic*) and when once heard there can exist no doubt as to its significance. The murmur is produced as the current of blood in its natural passage through the heart encounters resistance at the contracted valvular orifice; the valves being converted into a curtain with a slit in it (*the button-hole mitral*), or into a finger-like cone projecting into the ventricle. The bruit immediately precedes the first sound of the heart and carotid pulse; it is presystolic in character, and is coincident in time with the contraction of the auricles, and not that of the ventricles. It would serve no practical purpose to enterinto the vexed question concerning the exact time during the heart's revolutions at which this murmur is produced, but I would just notice a remark by Dr Andrew to the effect that it occurs at the latter part of the diastole and seems to be continuous with the first sound, from which it is difficult to distinguish an interval.* It is a short and rough murmur, and obliterates the second sound at the apex, but intensifies it at the base. Accentuation of the pulmonary second sound is one of the most constant conditions of mitral stenosis. Its loudness, like all other cardiac murmurs, depends upon the condition of the blood and the size of the aperture, and the force of the heart's action; but why it should disappear from time to time whilst the constriction remains unaltered, is at present unexplained. A cardiac thrill (diastolic) is usually present, and the left ventricle is contracted and its walls are thin, according to Niemeyer,† but Dr Balfour remarks, "as we never have mitral stenosis without regurgitation, some degree of hypertrophy of the left ventricle is almost always present, &c."‡ The left auricle is dilated and hypertrophied, and the right side of the heart also. The pulse is occasionally regular, but often weak, rapid and irregular. Mitral obstruction and regurgitation may exist together.[*] The murmur of mitral stenosis is heard at the left apex and inclining towards the right apex; whilst a regurgitant murmur is carried towards the axilla, or behind from the left nipple to the mesial line at the back. It is heard over a less area than that of regurgitation. It is generally, but certainly not invariably, limited to the mitral area—that is, within a circle of about an inch, described round the point where the apex impinges as a centre.[†] An attack of pulmonary catarrh with elevation of temperature will often render the murmur softer and more diffused.

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* "On Presystolic Murmurs at the Heart's Apex,' 'St Barth. Hosp. Rep.,' vol. xiii p. 1.

† 'Practical Medicine,' 1875, vol. i, p. 363.

‡ 'Diseases of the Heart,' 1876, p. 153.

The *causes* which induce valvular diseases of the heart in children are acute rheumatism, chronic albuminuria, chorea, and the specific fevers, especially scarlet fever; indeed, any circumstance which will set up pericarditis and endocarditis may lead to dilatation or contraction of the cardiac orifices, and to adhesion and rigidity of the valves which guard them. Dr Hayden considers the poison of scarlet fever as next in frequency to that of rheumatism in producing heart disease. He has traced many of the most formidable examples of valvular lesion to scarlatina. Children in whom it is most frequent rarely survive the second period of life. The complication generally declares itself in the second week of the fever; occasionally in the first week, or during desquamation.[‡] Endocarditis is set up as we have already seen (see page 516) and the valves (more especially the mitral valve) become involved in structural change. Of thirteen cases of heart disease associated with *scarlatina* which came under Dr Sansom's care, there were three cases of *pericarditis*; one case was uncomplicated, and two cases were complicated with *endocarditis* (mitral regurgitation). There were ten cases of endocarditis, inducing mitral regurgitation in eight cases, one case of dilatation of left and right cavities, mitral stenosis in one case, mitral stenosis and regurgitation one case. In six cases of heart disease associated with measles, there was *pericarditis* with *endocarditis* (mitral regurgitation) in one case; *endocarditis* inducing mitral regurgitation in three cases. In one case hypertrophy and dilatation; in one case tricuspid insufficiency; in one case mitral stenosis; in one case mitral stenosis and regurgitation.*

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[*] A girl, æt. 13, of rickety constitution, was admitted into the Samaritan Hospital, under my care, in Nov., 1878, with symptoms of mitral stenosis. There was no history of rheumatism or chorea, the disease being probably congenital. Two years previously she had a severe cough, and threw up a good deal of blood. The lungs gave some proof of hyperæmia and congestion. The heart's action was thumping and sudden; dulness extended to the sixth interspace below, a little external to the nipple line, and in the direction of the epigastrium. There was some hypertrophy and dilatation on the left side of the heart. There was no thrill, but a very distinct presystolic murmur, limited to the area of the cardiac apex, of a cantering sonorous character, fading in force towards its termination, like a sound dying away in the distance. It was well vocalised by the letters *Rrrb* or *Foot*, as Dr Balfour has pointed out (op. cit., p. 110). A louder and different murmur was heard posteriorly, and in the axillary line, also in diminished force over the right chest and back; it was systolic and had all the characters of a mitral regurgitant murmur. The pulse averaged 90: it was jerking, weak, and wavy, but regular.

[†] Balfour, op. cit., p. 103.

[‡] 'Diseases of the Heart and Aorta,' 1875, p. 315.

Dr Dyce Duckworth has collected eighty cases of mitral stenosis, of which only seventeen were males; the oldest patient was 63, the youngest (a girl) 14. He arrives at the conclusion that two thirds of the cases had a rheumatic origin, and that fright, strain, and other injuries are to be enumerated among the list of causes, or rather, as the writer observes, the valve not being healthy, these special causes were enough to aggravate the condition which already existed. Slow degenerative changes in the mitral valve leading to stenosis are, I think, rightly considered not uncommon.† In the case of two girls affected with mitral stenosis, who came under my notice, aged respectively 13 and 17, there was no history of rheumatism, nor of any illness that could account for this grave cardiac condition. Of the above eighty cases, six only were traceable to chorea. Of sixty-one fatal cases of chorea mentioned by Dr Hilton Fagge, there were only two in which all the valves of the heart were perfectly healthy.‡§

Treatment of valvular diseases.—This is at best but unsatisfactory. We cannot restore the injured valve in its integrity, but we can foster the growth of hypertrophy, and in some fortunate cases even restore the ventricular chamber to its normal size. The symptoms which arise as a consequence of these organic changes are best relieved by rest and the avoidance of exercise and excitement. By maintaining the general strength and guarding against local congestions and inflammatory attacks, we may often succeed in giving a fair share of health and comfort to children; while warm clothing (particularly cotton wool or flannel worn over the chest), nutritious food, and active aperients will tend to keep in check some of the worst symptoms, as dropsy, when they show themselves. If congestion of the lungs or bronchitis occur, squill, carbonate of ammonia, and other stimulating expectorants and sinapisms will be indicated.

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* "Clinical Lectures on Diseases of the Heart in Childhood," 'Med. Times and Gaz.,' October, 1879, p. 471.

† "On the Etiology of Mitral Stenosis," 'St Barth. Hosp. Rep.,' vol. xiii, p. 263.

‡ 'Reynolds' System of Medicine,' "Diseases of the Valves of the Heart," vol. iv, p. 169.

§ See Chap. XLV, "On Chorea."

When the heart is getting weak and quick in mitral disease, and there is a tendency to dilatation of the right cavities, tincture of digitalis, administered in gradually increasing doses, will improve the tone and fulness of the pulse beat, reduce the frequency of the heart's action, diminish pulmonary congestion, and cause the over-distended cavities to contract more vigorously on their contents. Instead, therefore, of blood accumulating in the heart during diastole, a larger quantity is expelled at each contraction of the ventricle. Digitalis generally increases the discharge of urine, if arterial tension does not remain low. I carefully measured the quantity passed in two cases of mitral regurgitation in children with dilatation of the right ventricle, yet in neither was there any appreciable difference in the amount passed, nor any change in its quality. They were in no way improved by the drug. Traube first noticed that the fall of the pulse rate, and the rise of arterial tension during the employment of digitalis, are attended with an increased amount of urine.

In most of the cases in which I have given digitalis for the heart affections of children, I have combined it with iron, and frequently with strychnia also. Iron improves the quality of the blood and the muscular power of the heart. Strychnia and nux vomica prevent the injurious effects of digitalis when this drug too much reduces the frequency of the heart's action. In mitral stenosis the good effects that follow its use are owing to the increased vigour which it imparts to the heart's contraction; by slowing its action, the period of diastole is lengthened, and thus longer time is afforded for the over-full auricle to empty its contents through the narrowed mitral aperture into the left ventricle. Digitalis is of most value in simple dilatation from debility in the cardiac muscle, and in both forms of mitral disease, where weakness and irregularity of the pulse are present. It may be given with advantage in dilatation with hypertrophy, but not in the latter form of heart affection alone. If nausea, headache, or unsteadiness of pulse should come on during the employment of digitalis, it should be intermitted for awhile.

Heart cough is common in adults in the failing stages of heart disease, and is usually found in children at any stage. It is the result of congestion of the pulmonic circulation; it is aggravated by sedatives such as paregoric, and even by bromide of potassium; it is effectually relieved by cardiac tonics like digitalis combined with iron, and when very troublesome it is well to put the patient to bed with complete rest for a week or two.

Hypertrophy and dilatation.—Hypertrophy of the heart, which consists of an increase in its muscular tissue, is owing to the greater effort which the organ makes to overcome the obstruction of blood through its cavities.

In children it is noticed as a consequence of valvular disease (especially of mitral obstruction or regurgitation), adherent pericardium, emphysema of the lungs, and chronic renal disease.

The *physical signs* are heaving impulse, diffused over a large space, visible to the eye, and raising the head of the listener when the ear is applied to the cardiac region. The apex beat may be seen and felt between the sixth and seventh ribs, or even lower. The pulse is full and strong in simple hypertrophy, but if accompanied with dilatation, the force of the arterial stream is considerably lessened. The heart's sounds are dull or muffled, and very rarely accompanied by murmur. The area of dulness is increased laterally, and to the left of the sternum when the left ventricle is involved. When pulmonary emphysema is present, the percussion dulness is masked through the margins of the lungs overlapping the heart. In rickety subjects the præcordial region is sometimes rounded or prominent. When the right ventricle is affected, which is common in long-standing cases, there is epigastric pulsation, and the margin of the ventricle can be felt to the left of the ensiform cartilage. When obstruction exists at the mitral orifice (most common in children), the left auricle becomes overfilled with blood and its cavity enlarged. As the blood accumulates in the pulmonary circuit, the right ventricle gradually becomes hypertrophied and dilated, so that one cavity after another is more or less affected. In mitral disease the left ventricle may remain stationary or contract in size, whilst the left auricle is enlarged; the heart is globular or rounded in form, and the apex chiefly consists of the right ventricle.

The *constitutional symptoms* vary according to the mischief which has produced the hypertrophy. The walls yield and the cavities undergo *dilatation* when the heart is enfeebled from over-exertion. The diaphragm is depressed and the enlarged heart tends to displace the lungs. General dilatation of the cavities is usually seen in fat and feeble adults who have suffered from menorrhagia, chronic bronchitis, or other exhausting illness, but in children it is most frequently the result of mitral regurgitation.

Hypertrophy of the heart, associated with more or less dilatation, is a common attendant on chronic kidney disease. The left ventricle is most frequently involved. It arises from overgrowth of muscle, in consequence of an obstacle in the smaller arteries and capillaries, which the heart is striving to overcome.* These vessels become contracted and cause high tension in the vascular system, because the structural change in the kidney prevents the elimination of urea, and other products of metamorphosed tissue. These accumulate in the blood and lead to thickening of the smaller blood-vessels, hypertrophy, dropsical effusions, and hæmorrhages.

The *general* signs of *dilatation* are a frequent, weak, or irregular pulse; the veins of the neck are often prominent when the right side of the heart is affected, and if the case proceeds from bad to worse, there is dyspnœa, bloated face, anxious countenance, and finally œdema or dropsy. The *physical* signs are a thumping action of the heart, if there is much hypertrophy, but if not, those of dilatation may prevail, and then the impulse is weak, short, or tremulous. The first sound is feeble and diffused.

The causes of dilatation, pure and simple, are anæmia and general debility, bronchitis and emphysema of the lungs, but it is usually associated with valvular disease as we have seen, and then the symptoms vary according to the orifices affected, and the degree of hypertrophy.

The *treatment* is that of valvular disease of the heart, with which both conditions are so closely associated.

Malformations are due to an arrest of development, the heart remaining after birth in a rudimentary form, as it was during fœtal life. Incomplete closure of the septa is the most common, the auricular and ventricular cavities being single, or the division very slight. The septum which divides the ventricles is occasionally deficient, and the two cavities communicate. The foramen ovale is also large and open in some cases, or the folds of membrane are not sufficiently developed to close the orifice, so that the blood passes from the right auricle into the left auricle. With this condition there is often contraction at the orifice of the pulmonary artery, which may be so reduced in size as barely to admit a quill. If the contraction be considerable and the foramen large, the right ventricle is small, and there is hypertrophy and dilatation on the left side. The ductus arteriosus, which is patent at the time of birth, may remain so, and defects in the valves are so frequent as to cause obstruction, and its consequences.

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* See Chap. XXIII, p. 232, "On Chronic Desquamative Nephritis."

We may enumerate *four* principal varieties of malformation:

1. Where the heart consists of only *two* cavities (biloculate heart), an auricle and a ventricle, with a single vessel supplying the systemic and pulmonic circulations. This form of malformation depends on arrest of development at an early period of fœtal life. Infants have very rarely survived a short period after birth.

2. In this variety development has proceeded further, and there are *three* cavities. It is rare, though more frequent than the previous variety. The auricles are separated by a more or less complete septum, and there are generally two auriculo-ventricular apertures; the septum which divides the ventricles is occasionally deficient, and the two cavities communicate. Two vessels are sometimes given off, the aorta and the pulmonary artery; the first may arise from the right ventricle, and the second from the left ventricle. There may be three ventricles, from the third of which the aorta and pulmonary artery arise.

3. Here the heart has *four* cavities, but one or both of the septa are incomplete. The interventricular septum may be defective, and the auricular cavities imperfectly separated, whilst the partition between the ventricles may be perfect, and the auricular septum imperfect, or the foramen ovale unclosed. Occasionally a form of malformation is met with in which all four cavities communicate in consequence of the septa of the auricles and ventricles being imperfect at the base of the heart. Apertures have been found in one or other of the septa after death in persons who have never suffered during life from any signs of obstruction or disorder of the circulatory system (Peacock).

4. The foramen ovale is large, or the valve absent, or it may be of the usual size, but the folds are imperfectly developed, and the opening is not effectually closed. In some cases the valve is fully

developed, and of its natural size, but the changes which ought to ensue after birth do not take place.

The semilunar valves may be excessive or defective. If there be only two valves, incompetence is likely, if only one valve, obstruction.

Various other malformations may exist, thus the ductus arteriosus may be obliterated, or prematurely closed; the aorta may be double, and there may be two ascending or two descending venæ cavæ.

Symptoms.—When the blood passes through the foramen ovale into the left auricle, or the aorta and pulmonary artery with the ventricles are not developed, the blood, by remaining long in the body, and not getting back to the lungs, becomes overcharged with carbonic acid, and the face, lips, tips of the fingers and toes, become intensely venous. The child is languid, and depressed in mind and body, whilst the temperature falls, and the surface is cold. The fingers and toes are clubbed, and the nails incurved. The condition known as cyanosis comes on, and the child is liable to attacks of dyspnœa, cough, convulsion, expectoration of blood, palpitation, and fulness of the vessels of the neck. In some cases the heart's sounds are normal, in others there are murmurs of a varied character, confused or distinct. If there be obstruction near the pulmonary orifice, a harsh systolic murmur will be heard in the course of the pulmonary artery. When heard it may be set down as congenital. If there be a deficiency in the septum of the ventricles, a murmur will be heard in the course of the aorta.

Cyanosis (*morbus cœruleus—Blue disease*) is one of the striking symptoms of malformation of the heart. The lividity has been ascribed to the intermixture of arterial and venous blood, when the septum of the ventricles is imperfect; but it has been shown that there is no just relation between the intensity of the cyanosis and the intermixture of the arterial and venous blood currents; indeed, marked cyanosis may exist without intermixture. Still, whenever it is present in a great degree, the causes which produce venous congestion invariably exist. Dr Peacock regards cyanosis as due to congestion of the venous system. It is not improbably owing in some instances to fulness of the venous radicles, and imperfect aëration of the blood. Dropsy seldom occurs.

Terminations.—Death from malformation of the heart may arise from cerebral disturbance, the result of congestion of the brain from collapse and congestion of the lungs, from exhaustion, and the circulation of venous blood.

Treatment.—This can only be to meet the symptoms as they arise without any chance of relieving the organic change. The patient should be protected from cold, nutritious food given and mental and bodily rest ensured. For further information on this subject, the reader is referred to Dr Peacock's work,[*] and many Foreign and English Journals, especially the 'Pathological Transactions.'

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[*] 'Malformations of Heart,' 1866.

CHAPTER XLI

ON DISEASES OF THE BRAIN

SIMPLE MENINGITIS.—PIA ARACHNITIS.—ENCEPHALITIS (PHRENITIS OF CULLEN).—INFLAMMATION OF THE BRAIN AND MEMBRANES.—*Morbid anatomy—Its proneness to attack the convexity of the cerebral hemispheres—A less frequent disease than the tubercular form.*—CAUSES—*Exposure to cold, heat, and privation—General debility—Traumatic origin—Effect of otorrhœa and foreign bodies in the ear in setting up meningitis—Specific fevers—Blood-poisoning.*—SYMPTOMS—*Headache and vomiting—Heat of head—Quick pulse and fever—Convulsions—Delirium—Loss of speech—Character of the pulse and respiration—Elevation of temperature—Coma—Diagnosis—Prognosis.*—TREATMENT—*To lessen vascularity in the inflamed part by depressing the circulation with aconite and tartar emetic, to soothe and calm the excited and inflamed encephalic centres—Iodide of potassium and hydrate of chloral—Use of mercury as a purgative—Continuous application of cold to the head—Leeches—Salines—Bromide of potassium—Tonics—Stimulants and counter-irritation in coma.*—TUBERCULAR MENINGITIS OR ACUTE HYDROCEPHALUS.—*Pathology of the affection and common seats of the miliary granulations—Their size, structure, and composition.*—SYMPTOMS—*Gradual impairment of the general health—Ophthalmoscopic signs—Insidious character of the vomiting—Constipation—Albuminous urine—State of the pulse and pupils—Hydrocephalic sighs—Temperature—Headache often mistaken for neuralgia—Hemiplegia and paralysis—Diagnosis—Prognosis.*—TREATMENT—*General hygienic rules to be strictly observed in the threatening stage.—Risk in hastily healing active eruptions of the scalp—antiphlogistic remedies in the early stages—Salines—calomel—cold to the head—iodide and bromide of potassium*

—*morphia*—CHRONIC BASILAR MENINGITIS—CHRONIC HYDROCEPHALUS—*Causes*—*symptoms*—*treatment*—*Compression*—*Paracentesis capitis*.—HYPERTROPHY OF THE BRAIN.—ATROPHY OF THE BRAIN.

Simple meningitis (*suppurative meningitis*).—Inflammation of the pia arachnoid is now known as lepto-meningitis. The arachnoid and pia mater are in such close relation to each other that it is not always possible to separate them in the morbid changes to which they are liable under the inflammatory process; neither are we clinically able to describe, with anything approaching exactness, the symptoms of inflammation of the membranes apart from inflammation of the cerebral mass itself. I do not happen to have met with an instance in which the arachnoid membrane has been inflamed and the pia mater not implicated also (*pia arachnitis*); but cases of the kind are recorded in the history of medicine. If the meningitis has been due to traumatic causes, then the dura mater is involved in the inflammatory process, and a circumscribed patch of fibrinous exudation or purulent matter may be seen lying upon it. According to Dr Greenfield, the pia mater is "primarily and chiefly affected" in secondary meningitis, or that arising from contaminated blood, whilst "in traumatic meningitis the dura mater and arachnoid, or the arachnoid itself, is chiefly involved."*

"Dura-arachnitis, or pachymeningitis with its effusion between the arachnoid surfaces, is an affection intimately connected with disease of the dura mater, and arises from some external cause; whilst the effusion beneath the arachnoid and immediately in connection with the cerebral substance, has its cause within, and constitutes the idiopathic inflammation of the membranes. In ordinary idiopathic meningitis, the effusion, be it lymph or pus, is poured out from the pia mater, a structure which consists of a most rich plexus of vessels, held together by delicate areolar tissue, following all the inequalities of the convolutions, and lying beneath the level surface of the visceral arachnoid membrane, with which it is connected by fine filaments, forming a delicate texture that crosses the sub-arachnoid surface."†

Morbid anatomy.—The anatomical appearances of simple or acute meningitis, then, are great hyperæmia and vascularity of the pia mater and arachnoid, with the effusion of serum, or the exudation of lymph, or sero-purulent matter, or pus itself, in patches of variable size, occupying the sub-arachnoidean space, dipping into the sulci, and obliterating the convolutions. Dr Goodhart relates the case of a child, seven months old, where the ventricles contained seven or eight ounces of turbid sero-purulent fluid, and there were also three drachms of pure pus in the posterior cornu of the left ventricle.*

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* 'St Thomas's Hospital Reports,' vol. viii, p. 145.

† 'Pathological Anatomy,' by Wilks and Moxon, 1875, p. 208.

When the dura mater is removed, the membrane beneath is seen to be vascular and congested either generally, which is very rare, or in patches over the superficial portion of the hemispheres. It sometimes presents a glistening whitish look, and is thin and almost transparent; or it is thicker, with an opalescent or faint milky appearance. Sometimes it is greenish-yellow, and does not exceed the thickness of a line. When the membrane is removed, distended vessels and inflammatory exudation may be seen dipping down between the convolutions and depressions of the brain; but in many cases the congestion is not more than may be observed in children who have died of fever, or some other acute disease, in which the brain has only shown signs of exhaustion during life. Occasionally the under surface of the arachnoid is covered with exudation, or false membrane, which contracts adhesions between it and the brain. A colourless fluid may also be seen in the ventricles, varying from one drachm to an ounce or more; and an opaque, gelatinous fluid may, in some cases, be observed at the base of the brain. Purulent matter is an occasional but rare occurrence. In some cases that have set in suddenly and terminated in a few days, the vessels of the scalp will be found distended with blood, and the brain and membranes turgid; lymph may be seen scattered over the convolutions, so as nearly to conceal them, and the substance of the brain is generally soft and vascular, whilst the serum in the ventricles is turbid or purulent. Some of these cases have received the name of "water-stroke" by Gölis.

In simple meningitis the convexity of the anterior lobe is more frequently affected, but the exudation may run along the surface of the brain posteriorly, and attack the inferior aspect of the cerebellum and the medulla oblongata. It may involve the upper portion of the spinal cord, and be surrounded by a considerable quantity of turbid serum. The lateral portions of the hemispheres, and still more rarely the under surface, are more affected in this form of meningitis; at the same time the extent and locality of the inflammation are variable, and the symptoms are much more acute in some cases than in others. It occurs occasionally among infants, but is very rare after the age of two years. Strong and healthy children are more frequently attacked than those who inherit delicate constitutions. Simple or idiopathic meningitis, not arising from local irritation or injury, tumours or other morbid growths in the brain or its membranes, must be considered as a rare disease.

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* 'Diseases of Children,' 1885, p. 395.

Causes.—Injuries of the head may set up meningitis in children. A young lady, aged 11, previously in good health, told her mother that she had had a fall on returning from school. She then ate a good dinner, but was sick in the evening; had severe headache and fever next day; the pain began on the *left* side of the head, extending in a few hours to the opposite side, and along the upper part of the spine. She died rather suddenly little more than forty-eight hours after the fall. The arachnoid was dry and rather opaque, with numerous yellowish-white patches between it and the pia mater. The vessels on the surface of the brain were much distended. No disease of either tympanum or petrous bone could be detected. Dr Crisp thought that the fall, which might have been more severe than at first supposed, was the cause of the meningitis, which was remarkably localised (as the brain-substance was healthy) and unusually rapid.* Meningitis may ensue from concussion of the brain at once, or follow it after weeks, or even months, if the child has attempted to exert its brain too soon after apparent recovery. Immoderate reading, over-pressure at school, extremes of heat and cold, checked eruptions about the head and face, are also to be enumerated among the causes. A frequent cause is the extension of inflammation from the internal ear. A slight degree of internal otitis without discharge from the ear or caries of the bone, is sufficient to provoke the affection.† The symptoms of otitis may precede those of meningitis, or the meningitis may set in without any premonitory symptoms of otitis. Again the symptoms of otitis may arise during the course of the meningitis, or the otitis be latent, and never discovered throughout the illness.‡ But long-standing otorrhœa, which has led to disease of the petrous portion of the temporal bone, the exanthematous fevers, and especially scarlet fever, are causes of the affection. If in a child so suffering, delirium, high fever, convulsions, or coma result, we may suspect the supervention of meningitis. Erysipelas probably induces the complaint in a similar manner. A case is recorded of fatal meningitis in a child induced by the rough measures which were employed to extract a stone from the ear.* It may occur as an epidemic in conjunction with inflammation of the spinal meninges, constituting cerebro-spinal meningitis.† The action of the poison is directed to the meninges, just as the blood infection of septicæmia, albuminuria, syphilis, rheumatism, or the specific fevers may originate meningitis or pleurisy, or any other form of serous inflammation. Simple meningitis may follow whooping-cough and broncho-pneumonia.

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* 'Trans. Path. Soc.,' vol. xxvii, p. 28.

† "On Simple Meningitis," by W. S. Greenfield, M.D., 'St Thomas's Hospital Reports,' 1877, p. 143.

‡ "Meningitis and Otitis Interna," 'St Bartholomew's Hospital Reports,' vol. viii, p. 25.

Any long-continued illness in a badly-nourished child exposes him to the dangers of cerebral disease, especially if he is the offspring of tubercular or syphilitic parents. Approaching dentition renders him more susceptible through the irritation it excites—a tedious attack of diarrhœa still further impoverishes the brain, and reduces the general health. Croup, bronchitis, or any other acute disease, will be equally powerful in disturbing the equilibrium of the circulation, and fretting the nervous system till it culminates in an actual outbreak. Watch the out-patient department of any London hospital where there are a fair number of children, and we shall often find that a child who is recovering from diarrhœa, or has an eruption of the scalp, or suffers from general debility, or has been exposed to great heat, and the scorching rays of the sun, is suddenly seized with a fit of convulsions, followed by inflammation of the brain.

Symptoms.—In most cases of simple meningitis, languor, drowsiness, and excitement manifest themselves for some days before the accession of more dangerous symptoms. Severe headache is one of the most constant and persistent indications. It may be so acute as to cause the child to utter a piercing cry, and to shun the light. Vomiting and constipation are often present, and thirst is frequently complained of as long as the intellect remains clear. The head is often retracted and the muscles of the neck are stiff, the abdomen is concave, and the skin readily becomes red if the finger-nail is drawn across it (*tache cérébrale*). The eyes have a wild and glistening look. The pupils are generally contracted, but they have been noticed large and sluggish. Sometimes they are unequal in size. Strabismus of one or both eyes is frequently present, the vessels of the conjunctiva are injected, and the temporal arteries throb. The child may draw a deep sigh now and then, and move its head about on the pillow as if in uneasy sleep. The head is hot, and the veins about the the temples swollen and dilated in some cases, whilst in others the face presents a pallid look, alternating with an occasional flush over the malar bones and upper portion of the cheeks. Then follow wandering and delirium at night, with intervals of consciousness during the day, to be shortly succeeded by convulsions, or increasing exhaustion and death. The *temperature* is generally elevated, though it is not always so in the early stages of meningitis. In some cases it runs exceedingly high. It may vary three or four degrees during the day when there are relapses and exacerbations. Thus in the morning it may be normal, and by the evening reach 103° or even 106°, especially if the case has succeeded scarlet fever, otitis, or pneumonia.

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* "Contributions to Aural Surgery," by W. B. Dalby, F.R.C.S., M.B., 'Lancet,' Sept. 25th, 1875, p. 447.

† Meigs and Pepper, op. cit., p. 509.

The *pulse* is generally frequent, sharp and incompressible, and often intermittent. It may be slow at the commencement, or decline of the illness, but it readily becomes accelerated after food, or any attempt to examine the child. The breathing may be soft and regular at an early stage, but it becomes sighing, and of the Cheyne-Stokes character at the end of the illness. The disease may begin with acute symptoms, and in the course of two days attain its climax. Some cases set in slowly and insidiously, and the most careful and experienced practitioner may be deceived as to what is about to happen. This difference in the symptoms is chiefly owing to the circumstance that the disease may come on primarily or in consequence of some other disease. In the latter case there may be nothing but great depression of the vital powers, and eventually paralysis, while where it is primary, it is usually ushered in with rigors, high temperature, and a quick pulse. The symptoms are more developed in some cases than in others; but it must not be supposed that we are not dealing with meningitis because a few of the symptoms only are present, and have not succeeded one another in any regular order. Each case has its special class of symptoms —it may have a tardy and obscure beginning, of days, or even weeks, or be sudden and fierce in its development.

Some cases set in with a paroxysm of convulsions, especially in very young children, which, according to Andral and Sir Thomas Watson* denote greater certainty of cerebral inflammation than delirium. But cases so beginning have shown, after death, the brain substance to be free from inflammation altogether, and no lymph in the arachnoid cavity. Both Andral and Abercrombie have seen instances in which loss of speech was the first indication of the illness. In the case of a child, aged three years, whom I attended, the first symptom to direct attention to the brain was the sudden loss of speech, or rather an imperfect guttural articulation. This was followed in the course of a few days by headache, pyrexia, and vomiting; quick pulse; ptosis and partial hemiplegia, and no amendment in the power of speech. The urine was slightly albuminous. When the little child was asked a simple question it moved its lips sluggishly, and the tongue performed a peculiar rolling motion, but nothing like an articulately pronounced word could be uttered. When nausea and vomiting are the earliest symptoms the inflammation is said by Sir Thomas Watson to have originated in the substance of the brain; when convulsions have attended the outbreak of the symptoms, it has originated in the arachnoid or pia mater, and when early and fierce delirium are present, the grey portions of the convolutions or superficial parts of the hemispheres are first invaded. Delirium is a striking feature of irritation or excitement of the membranes, whilst convulsions are oftener associated with cysts and deep-seated tumours, or such changes as occur at the base of the brain in some forms of chronic and tubercular meningitis. As the disease advances towards a fatal termination the breathing is irregular and often sighing: it is sometimes so tranquil that it seems to have suddenly stopped. The expression is bewildered and confused, and the eyes are fixed and staring. The pupils may be of equal size, even if convulsions and restlessness are present; but if the child becomes unconscious, and there are any symptoms of paralysis, then one or both may become widely dilated and insensitive to light. When comatose symptoms occur at a later stage of the illness, the pupils become dilated, or one is more dilated than the other, and there may be squinting and partial ptosis.

Dr Greenfield observes that in the larger number of cases of acute meningitis of the vertex, whether simple or tubercular, optic neuritis is absent. If any affection of the eye exists in meningitis of the vertex it is more commonly swelling of the papilla or choked disc, and any further change is only reached in cases of subacute localised meningitis; such are oftenest syphilitic.* In a case of meningitis complicated with otorrhœa, in which after death the membranes were found thick and opaque, the optic nerve was covered with a whitish cloud partially hiding the vessels, and there was optic neuritis from congestion of the vessels along the optic nerves. (Gee, op. cit.) The pulse may now become so rapid that it cannot be counted, and the heart's action may be feeble and tumultuous. The radial pulse is not to be detected at each fluttering cardiac contraction. Instead of the fierce delirium of the early stage, the child may now be observed to roll its head from side to side, and there is flushing of one or both cheeks, as is frequent in the evening paroxysm of typhoid fever in young subjects. Add to this catalogue of symptoms the presence of stertor, and indications of gradual effusion going on at the base of the brain, and we complete the description of a hopeless condition. The belly is sunken and retracted, the motions are dark and offensive; and as the disease advances they may be passed in the bed unconsciously. In those exceptional cases that recover signs of improvement either set in early, or the disease does not reach the severe stage I have been describing. It is more chronic and obscure, and does not advance with the velocity of the fatal forms.

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* 'Practice of Physic,' vol. i, p. 395, 4th edit., 1857.

Diagnosis.—This disease has many points which resemble tubercular meningitis, but it is less frequently met with than that affection. It generally selects the convexity of the cerebral hemispheres, whilst the base of the brain is the chosen seat of the exudation in the tubercular variety. In those cases that begin with irritability, shyness of manner, uneasy sleep, headache, and sickness there is difficulty at first in forming a differential diagnosis, as these symptoms are common to fever and general intestinal derangement.†

If a child with febrile symptoms has headache, nausea, or vomiting, and brings up bile, we must be careful lest we direct our attention to the stomach, and neglect the head. If the abdomen is soft, and free from distension and tenderness, if the bowels are costive and the tongue is clean, these signs are of ominous omen. If they vanish for a time, and recur again, and there has been no indiscretion or irregularity in diet to account for the symptoms, the brain is probably at fault. There are cases of cerebral disease to be met with in young children, preceded by such insidious indications of failing health that the possibility of brain affection is overlooked altogether, and the symptoms are either attributed to fever or chronic tuberculosis, or they are too obscure for the practitioner to form a diagnosis. At an early period it is doubtful where there is any morbid change in the membranes or cerebral tissue, as some of the symptoms which spring from excentric sources of irritation may propagate an indirect influence to the brain, and give them the semblance of issuing direct from the brain itself. Headache, drowsiness, and sickness in meningitis are among the earliest symptoms inviting our attention to the brain as the organ primarily at fault. When these symptoms are absent we may naturally overlook the disease.

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* 'St Thomas's Hospital Reports,' 1877, p. 160.

† See Chap. VI, "On Typhoid Fever," p. 53.

Prognosis.—This is most unfavorable. Simple meningitis, however, when it does not result from traumatic causes, must not be considered beyond the hope of recovery. The exudation poured out under the inflammatory process slowly contracts into a fibrous structure, and the pia mater into a whitish firm membrane, adherent to the brain on one side, and the under surface of the arachnoid on the other. A case recovers now and then under great care and patience, if the disease has not set in with fierce delirium or convulsions, and the fever is moderate. Death at the end of a week is the rule. Sometimes the disease terminates fatally in less than forty-eight hours. The general intelligence was defective in one or two of the few cases I have seen recover, and the memory and power of attention were impaired. Sometimes the brain is never again able to bear full intellectual tension, but morbid anatomy reveals nothing incompatible with it in the case of young and otherwise healthy children. In one case under my care which completely recovered, there were convulsions, hemiplegia, and strabismus during the illness, which extended over three months, and the motions were passed involuntarily.

A remarkable recovery from meningitis is recorded by Dr Dickinson, in a little girl aged 5 years and 5 months, who came under his care at the Children's Hospital, March 17th, 1881. The patient was the ninth child, five elder children were still-born, two other surviving children were healthy. There was no history of consumption or syphilis. The chief symptoms were "*long-continued and extreme retraction of the head and flexion of the* *limbs; double optic neuritis and loss of vision; bed-sores, recovery with good vision and powers of movement.*" On admission there was emaciation; dry tongue, sordes on lips, flat abdomen; irregular fever, chiefly nocturnal; frequent screamings and occasional vomiting. On March 22nd she became suddenly cold, clammy and pulseless, but rallied under the use of brandy, hot water bottles and faradisation of the phrenic nerves. For the next week she remained in a semi-comatose state, the temperature had risen once to 101°, but was generally at or below normal; a convulsion set in chiefly affecting left side of face, and returned on April 9th and 10th. There was neuro-retinitis on both sides. About a week later the left membrana tympani gave way and there was a discharge of pus. May 2nd.—Another unusually severe convulsion, consciousness nearly lost, and bed-sores over great trochanters. June 11th.—The temperature reached 104·8°, and after remaining high for a week then fell; the left optic disc was in a state of atrophy. July 1st.—There was remarkable immobility, and she would lay in the position put for hours and days together. Evacuations were passed unconsciously. Aug. 3rd.—The temperature rose again to 103·2°, retraction of head was greater, and she screamed. After this she improved and in a month was able to speak; the pupils were dilated, but she could not see. Oct. 13th.—Vision began to return, and in December she could see fairly well. In March, 1882, she could stand alone, and walk with the support of a hand. In June, the general health was good, the legs and body were fat, and she could walk badly. The *treatment* consisted in giving half a grain of calomel three times a day for the first week after admission. In April she took three grains of bromide of potassium and one grain of iodide of potassium three times a day. On June 14th she was ordered a grain of calomel every night, which she took, on and off, for three months.*

Treatment.—A child suffering from acute meningitis should be put into a darkened room, at a temperature not exceeding 60°, and kept perfectly quiet. No noise or conversation should be permitted. The little patient should be seen at least every four or six hours, to watch the effect of the progress of the disease on the one hand, and the action of the remedies on the other. The principle of treatment is comparatively simple. It should combine two elements. 1. To lower the vascularity in the inflamed part by depressing the circulation, and for this end we possess two well-known agents, aconite and tartarated antimony. 2. To soothe and calm the excited or inflamed encephalic centres, and this is best attained by the use of iodide of potassium. These agents then may be combined. Chloral hydrate probably produces both of these effects. It must, however, be borne in mind that all depressants in children are apt to produce varying results, even ordinary doses will induce at times an unanticipated degree of prostration, out of all proportion to the dose employed. Careful observation and repeated attention, at comparatively short intervals, are therefore demanded, in order to note if the remedies are exercising too great an effect.

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* 'Brit. Med. Journ.,' vol. ii, 1882, p. 738.

Each case having special and peculiar features, no plan can be laid down as suitable for all. In the acute and early stages of the disease, mercury is a remedy of undoubted value, and ought to be employed, but only as a purgative to ensure a free discharge of bile. The bodily powers must be carefully estimated before we resort to it. It is essential that the bowels be kept freely open, and the renal secretion encouraged as tending to lessen cerebral congestion. The employment of calomel on the plea of preventing exudation is nearly an exploded theory, though the remedy in small doses has many advocates, and when continued for some time in the more chronic cases it has seemed to facilitate the absorption of inflammatory products. Iodide of potassium is a better drug, and more reliance is to be placed on it; in combination with bromide of potassium I have known recovery in two cases follow its use. I have never seen any benefit follow the use of quinine, or the temperature to fall under its use. If the case is at all acute, the symptoms, instead of yielding, will only become aggravated.

The head is to be kept cool, and cold applications used, either by ice in a bladder, with the effect vigorously watched, whilst the delirium is fierce and active, or, what is far preferable, the ice-cap, as employed at the Samaritan Hospital in cases of surgical fever and cerebral congestion. At the same time mustard poultices may be applied to the calves of the legs, and the feet kept warm.

Leeches have been used, but they are not very satisfactory, and can scarcely be advocated in young children, the loss of blood not being well borne, except in very special cases. The pallor of the face and frequency of pulse that follow their use, should make us extremely timid of their application; and yet, from the cerebral congestion witnessed in some fatal cases, the abstraction of blood appears warrantable. When used they should be applied to the vertex, or close behind the ears, where pressure can be readily applied, if the bleeding is too active, and there is fear of the child losing too much blood. They may be employed with greater chance of good than in the tubercular form of the disease, where the evil might be aggravated. Dr Wilks is in favour of leeching. He says that if a child has acute meningitis setting in, there is no better treatment than the application of leeches, and a saline with antimony.* Salines, as chlorate and citrate of potash, are to be recommended when the acute symptoms are lessening, or the urine is turbid and high coloured.

Hydrate of chloral is sometimes useful, and especially bromide of potassium in large doses. These remedies will often check the tendency to delirium and convulsions.

In the early stages, when the symptoms are acute, the diet should be low and unstimulating. Cold drinks should be given freely. Later on small quantities of milk and beef tea will be necessary. These forms of nourishment will be the more needed as the case assumes a chronic character. Great caution is required in administering food to a child who is only partially sensible, particularly if there is any difficulty in swallowing. The head should be gently raised from the pillow, and no attempt made to put more food into the mouth than can be swallowed at one time.

When coma has set in, a blister at the nape of the neck, or behind the ears is advisable, and such stimulants as ammonia and spirit of chloroform should be given.

Acute meningitis runs a rapid course in spite of bleeding, leeching, aud the most active treatment. It may destroy life in twenty-four hours, and the patient never recover consciousness from the time of the attack, or it may last some weeks in exceptional cases.

Tubercular meningitis—acute hydrocephalus—basilar meningitis.—The pia mater is the membrane in which the deposition of tubercle takes place in the form of miliary granules. According to some pathologists they are not seen on the free surface of the arachnoid, or in any way connected with it; but this to me is a doubtful point, seeing the affinity which tubercle has for serous membranes in other parts of the body. Unlike its loose investment around the spinal cord, the arachnoid is closely adherent to the pia mater, except where the latter membrane dips into the convolutions, and the arachnoid stretches across them. Here the tubercles in cases of meningitis are most abundantly seen, and they are often found in this situation when they cannot be detected in any other. This looks as though the arachnoid had some attraction for the deposit, as the pia mater quits its fellow membrane at the base of the brain, where its uneven surface admits of the divergence being readily traced. The connective tissue of the arachnoid resembles the delicate structure of the pia mater itself, which is made up of flat membranous cells, connective-tissue bundles, and elastic fibres,[*] so that where the two membranes are firmly united, it is not possible to say which was the most attractive to the morbid change. The arachnoid then, having all the characters of a serous membrane, and presenting tubercular deposit at its freest part, seems to be as much a factor in the process as the pia mater. It is important to exercise great care in looking for these small granules lest they escape notice; they should be diligently sought for wherever any exudation of yellow fibrinous or amorphous matter is found. These miliary granulations may be observed in the Sylvian fossa, and the longitudinal fissure, and in the course of the vessels along the base of the brain to the medulla oblongata, especially about the cerebellum, where the eighth and ninth pair of nerves may be concealed by a semi-gelatinous effusion. The origin of the olfactory nerves, the tuber-cinereum, locus perforatus, the commissure of the optic nerves, and the anterior half of the pons Varolii may be completely hidden by this exudation. The growths are sometimes the size of pins' heads, of a greyish-yellow, semi-transparent colour, and have long since been ascertained not to depend on any inflammatory products, as formerly supposed. Sometimes they may be observed adherent to the pia mater, where it dips down between the convolutions; but at the base of the brain, where the arachnoid covers the cerebellum, they may be detected clustering together in the greatest numbers. These tubercular growths appear to be in intimate relation with the smallest arteries, on the sides of which they form a distinct projection. They consist chiefly of small cells, a little larger than a blood corpuscle, and numerous free nuclei.[†] The inflammation associated with these small bodies has no distinctive character from ordinary inflammatory changes. Sometimes caseous and degenerative products are set up, as may be observed in scrofulous inflammation, or they undergo similar changes themselves, and lead to effusion in the ventricles. The choroid plexus is full and vascular in a few cases; it may be pale, however, and the surface of the corpus callosum and optic thalami soft and eroded.

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* 'Diseases of the Nervous System,' 1878, p. 137.

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[*] 'Frey's Histology,' by Barker, 1874, p. 599.

[†] For an interesting account of the minute anatomy of meningeal tubercle, the reader is referred to 'Jones and Sieveking's Pathological Anatomy,' by Payne, 1875, p. 242.

The quantity of fluid contained in the ventricles is variable. In some cases it distends them and flattens the convolutions; in other cases the quantity is very small. It may be clear or turbid, sero-purulent, or tinged with blood. The walls of the ventricle may be soft and present a faint pink hue, appearances which have been attributed to inflammation by some, and to the absorption of fluid by others. As a rule, the brain is softer than it is in health; it is generally pale and bloodless, but in some cases the puncta of the white matter exude freely, and the grey matter is congested. The subarachnoid spaces may contain a considerable quantity of a clear, serous, or milky fluid, from the locus perforatus in front to the medulla oblongata behind.

Tubercular meningitis is generally associated with the deposit of tubercle in other parts of the body, particularly in infants and very young children. In older children general tuberculosis is less frequent, and tubercle in the brain is not invariably associated with the deposit of tubercle in other parts of the body. In most fatal cases, however, in addition to the morbid changes found in the brain, the lungs, liver, spleen, kidneys and mesentery may be studded more or less with tubercles. In one case under my care the abdominal peritoneum over the centre of the diaphragm was "honeycombed" to the size of the palm of the hand. There is no lymph on the surface of the brain as in simple meningitis, but at the base. If tubercles are not visible to the naked eye they may be detected by the microscope in the course of the vessels.[*]

This disease is usually met with in children of from one to seven or eight years of age. Of 48 males affected, at the Children's Hospital between August, 1862, and March, 1871, 35 were under five years of age; and of 33 females, 23 were under five years of age.[†] It may happen to children of a few months old; but the ages I have given are the most frequent. When children grow older the lungs are more likely to be attacked than the brain.

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[*] Wilks and Moxon, op. cit., p. 212.

[†] 'Reynolds' System of Medicine,' article "Tubercular Meningitis," by Dr Gee, 1872, vol. ii, p. 384.

Symptoms.—As in some other forms of nerve disorder, the child usually exhibits evidence of impaired health for some time before the outbreak of cerebral symptoms. The disease is less acute than simple meningitis and generally runs a course of three or four weeks.* There is an absence of animation and habitual liveliness about the child. It throws its amusements abruptly on one side, as if they tired or annoyed it, and it falls asleep in the daytime. It cries without reason, and quarrels with its companions. It is morose, shy, and timid; and becomes inconsolable if its mother leaves it or entrusts it to the care of a stranger. It may have been losing flesh, and looking delicate and pallid; but not more than is constantly observed in young children who are otherwise in average health. In this premonitory stage there may be simple irritation or congestion of the brain, and until inflammation occurs, the child may go on in this condition for an indefinite period. If these threatening symptoms attract attention they may sometimes be subdued by appropriate treatment, and weeks of careful watching and strict diet may avert the coming evil; for it is doubtful whether true meningitis ever develops itself suddenly, some obscure symptoms of a local or general nature may have escaped observation.

The symptoms that demand especial notice are vomiting, constipation, alteration of the pulse and respiration, strabismus, and local or general convulsions and paralysis. The ophthalmoscope is of the greatest service in these cases. In a diagnostic point of view there are several considerations to be analysed and dwelt upon.†

Ophthalmoscopic signs.—Optic neuritis when present in these cases, is of great assistance in diagnosis, and more especially if there be vomiting, headache, strabismus, and irregularity of pulse. Optic neuritis consists in swelling of the disc, so that its margins are more or less obliterated, the surface discoloured or vascular, the arteries contracted, and the veins distended and tortuous. Meningitis is the most frequent disease in which optic neuritis occurs, but as it is also present in cerebral tumours, softening of the brain, chronic Bright's disease, abscess of the brain, and some other acute diseases, it does not alone prove the presence of meningitis. I have elsewhere stated that congestion and haziness of the optic discs, with distension of the retinal vessels are the most frequent changes that occur in tubercular meningitis.*

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* Wilks and Moxon, op. cit., p. 210.

† The diagnosis from pneumonia, pleurisy, and typhoid fever, is given in the chapters on these subjects.

Tubercles in the choroid have been spoken of as being sometimes observed with the ophthalmoscope, but I think they must be very rare, and as Dr Clifford Allbutt observes, "they do not occur with sufficient frequency to raise them out of the domain of pathological curiosities."†

The absence of opthalmoscopic signs may mislead us, if the general symptoms are not well marked, as frequently happens when the case is seen at an early period. When, moreover, the tubercular inflammation is limited to the upper surface of the brain, or even the posterior portion, changes in the optic discs are not so commonly seen, as when the meningitis attacks the base. Dr Garlick states that changes occur in the fundus oculi in cases of tubercular meningitis in about 80 per cent.

Sometimes the struggling of the little patients is so great in attempting an ophthalmoscopic examination, that it is better to abandon it.

The usual and characteristic exudation in these cases consists of a lymph-like deposit around the corpora quadrigemina and the origin of the optic nerves. This exudation is the result of inflammatory action; it exerts pressure, which in the first instance produces simple congestion in the optic discs, or retinal vessels, and subsequently leads to optic neuritis, and even atrophy. Sometimes the inflammation extends from the membranes to the optic nerves, and causes the neuritis.

Vomiting is a frequent symptom, and often steals on insidiously. The child takes its food as usual, but rejects it the instant it is swallowed, yet it is willing to eat again immediately afterwards. It may be sick only once in the day, at first; but as the disease advances sickness usually becomes more frequent, and the stomach will reject plain water. This form of vomiting is unaccompanied by pain or gastric disturbance. Where this symptom has been of some duration the eyes are sunken, and have a languid look, whilst the face is pinched and thin. It may be present in the subacute as well as in the acute varieties of meningitis, and may, in the former cases, have lasted some considerable time without attracting notice. In the absence of headache it is often overlooked, but having once begun it usually goes on, the appetite diminishing meanwhile; the belly is flattened and concave, the edges of the receding ribs have a sharp outline, and the intercostal spaces are sunken and retracted. Vomiting, however, is not invariably present, and a case of tubercular meningitis may run its course from beginning to end without this symptom. I have seen several such cases.

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* 'Medical Society's Proceedings,' vol. v, p. 346.

† 'On the Ophthalmoscope,' 1871, p. 100.

Constipation, as in simple encephalitis, is the rule, and a full dose of aperient medicine is required to move the bowels. The motions are generally dark or clay coloured, and fœtid; but they may be healthy looking and only diminished in quantity. Still there may be diarrhœa, and this circumstance should not beguile us into looking elsewhere for an explanation of the head symptoms. Diarrhœa and fever in meningitis are confessedly embarrassing signs, as they are the two characteristic and cóncomitant symptoms of typhoid fever. As the disease advances the motions may be passed unconsciously.

There is not much thirst in the absence of febrile phenomena, except in those cases of tuberculosis in other organs of the body, when the evening temperature runs up to 105° or 107°, and the skin is hot and pungent; in the latter stages of uncomplicated meningitis the fever may run high. As the disease advances and sensibility is blunted, the bladder is apt to become paralysed, and the urine ammoniacal and albuminous. I have seen the bladder distended up to the umbilicus, and requiring the use of the catheter. Vogel* says he has not found albumen in the urine of these patients; but if it is searched for carefully, we shall detect it frequently in this as well as in many of the congestive and inflammatory diseases of children. When it is small in amount, and the solids of the urine are sufficiently eliminated, it is of no great import, and does not add to the gravity of the case.

The *pulse* deserves our closest attention in this disease. It is variable in force and frequency; and this fluctuation may be taken to indicate pressure either from fluid slowly poured out into the ventricles, or from increasing congestion of the cerebral vessels. In the early stage of the disease the pulse may be quickened, but it is usually regular; later on, it lessens in frequency, and we have the slow pulse of hydrocephalic disease. It may be slow one hour and quick another, and become rapid or irregular after food, and whilst digestion is proceeding. Irregularity of the pulse in force and rhythm are great aids to diagnosis. If that stage of the disease is reached when it is fluttering and too rapid to be counted, it is significant of great danger, and the end is not far distant. We cannot infer with anything like accuracy that the state of the pulse or pupils is indicative of effusion or congestion, nor can we make out with certainty what changes have occurred in the consistence of the brain.

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* 'Diseases of Children,' 1875, p. 364.

Two cases of tubercular meningitis are recorded in which the pupils were alternately dilating and contracting; in the space of a minute the pupils would pass from extreme dilatation to extreme contraction. The patients were both unconscious, and the diagnosis was confirmed after death.*

The character of the *respiration* is a most significant sign. It is similar to what is observed in simple meningitis, irregular or fluttering—*hydrocephalic sighs*—tranquil, as if momentarily arrested, then gasping as if death were at hand. This is an indication of nervous exhaustion, and unsteadiness in the respiratory centre. When the pulse is quick the respiration is also accelerated in many cases; but these functions do not hold the close and orderly relationship which is generally assigned to them. The temperature may run up to 104° in cases of surgical pyrexia, without any increase of respiration—it may be 101° and the respiration 42—and when the temperature reaches 103° the respiration may fall to 20. So with the pulse, when it has fallen as low as 68 strokes in a minute, the temperature has been known to reach 104°. Some allowance must be made for the difference in the class of cases, since in tubercular meningitis, with increasing venous congestion, the respiratory movements are excited to greater frequency.

The *temperature* in tubercular meningitis demands careful attention. At the beginning of the complaint it may be normal, although the pulse is considerably increased in frequency. This may go on for an uncertain period, sometimes for two or three weeks, and then the temperature in the morning may be 100°, and in the evening 102° or 103°. Fever may be absent altogether for some days when the disease begins insidiously, or in more chronic cases. The temperature may not greatly exceed the normal throughout the illness, or it may rise and fall as we see in enteric fever, and thus be perplexing in diagnosis.* Wünderlich observes that it is exceptional for the temperature to rise as the fatal termination approaches, that it sinks rather, if it has been febrile, and that during the death agony the sinking may continue. In my five fatal cases, the temperature rose gradually, or irregularly, from the time the patients came under observation, and in four of the cases there was a very considerable elevation before death—103·6°—105·6°—104·2°—105°. This high temperature just before, or at the time of death is a frequent symptom, and a sign of approaching dissolution.

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* 'St Bart. Hosp. Rep.,' vol. xiii, p. 218.

Headache is a frequent symptom at one or another stage of the disease. I have met with it at the period of invasion, and noticed in one well-marked case how the little boy carried his hand to his head when he was too young to speak. When it is continuous or severe, the child will cry out with it, and if old enough will tell you that his head aches.

In meningitis the muscles of the neck are often contracted and the head is thrown back. When laid down to sleep the patient will roll his head from side to side and utter piercing cries of pain. He has starting and tremors in his restless sleep, and the pupils turn upwards, under the half-closed eyelids, and reveal the conjunctiva. Squinting may be observed in the early periods of the disease when it is acute, and also, in many slow and chronic cases, long before the brain is suspected of going wrong; but, as a rule, it is a late symptom of the disorder, and is complicated with inequality of the pupils, and the absence of sensibility in the conjunctiva, when the finger is passed across the eyeball in sleep.

Hemiplegia and *paralysis* of one arm and leg are to be noticed as occurring in the latter stages.

Diagnosis.—When the headache is paroxysmal, one day present, and another absent, and the temperature remains low, it may be mistaken for neuralgia, more especially if the health has been failing for some time. I have seen the error committed. Like the simple form of meningitis, the tubercular may resemble typhoid fever in many respects, but the history of the case, the retraction of the abdomen, the stiffness of the neck, the intolerance of light, and the irregularity of the pulse and respiration, are all aids in removing any doubts that may exist. As to framing a diagnosis between simple and tubercular meningitis, there are no symptoms on which we can depend, but it is probable that the first form sets in more suddenly, that the symptoms are more acute, and that it runs a more rapid course.

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* See Chap. VI, "On Typhoid Fever."

Prognosis.—This disease is so generally fatal, that the practitioner can hardly hope to save his patient, if the meningitis arises from tubercles in the membranes. I have not been successful in a single case, and I am inclined to think that the few cases of recovery which have come under my notice, have not been of the tubercular type. Dr Wilks has no knowledge of any person recovering from tubercular meningitis.* This is the experience of many other physicians. Recently, however, several cases of recovery have been placed on record which appear to have been genuine. Dr Clifford Allbutt does not believe that the disease is uniformly fatal in children.† Dr Garlick refers to four successful cases.‡ I cannot avoid coming to the conclusion that the cases of recovery are those rare ones in which a few tubercles are deposited about the base of the brain, and that they occasionally become quiescent in the fibrinous thickening and contraction which result from the inflammatory process. The cases of recovery can only be those in which the tubercular mischief is not associated with tubercles in other parts of the body, and this is very rare. As I have elsewhere stated, many of the so-called cases of recovery from tubercular meningitis may have been simple forms of the affection arising from exposure to heat or cold, checked eruptions of the scalp, or from blood infection due to syphilis or rheumatism, or to the eruptive fevers.§ In five fatal cases I have recorded, tubercles were found in the lungs, liver, spleen, kidneys, and mesenteric glands, but, as previously stated, the tubercle may be limited to the brain, when there is a greater chance of cure.‖ We have already seen that in simple meningitis death usually takes place in a few days, and in the disease under consideration we have not only cerebral inflammation to contend with, but an inflammation kept up by the irritation of tubercular deposit.

Treatment.—When the disease is threatening, every attention should be directed to remove all sources of irritation that lead to cerebral congestion. The mental powers should not be taxed by lessons, and active remedies should not be employed. The head should be kept cool, and the bowels gently stimulated by the mildest laxatives; the diet should be nourishing and unstimulating, and the heat of the sun avoided. Pure air, lively companions, and cheerful surroundings are important; running and active physical exertion should be discountenanced.

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* 'Diseases of the Nervous System,' 1878, p. 136.

† Op. cit., p. 85.

‡ 'Med.-Chir. Trans.,' 1879, p. 450.

§ 'Medical Society's Proceedings,' vol. v, p. 347.

‖ Ibid., p. 339.

When the disease is established the child should be well fed; beef tea, chicken broth, Brand's essence, milk, eggs, and custard are the proper kinds of nourishment.

The occurrence of porrigo and obstinate eruptions of the face and head require careful management, especially during dentition. In the autumn of 1874 I met with a fair and delicate child, two years of age, who had an active eczematous eruption of the whole scalp. It had remained obstinate for months, sometimes being dry and covered with crusts, and at other times discharging freely under an oil-skin cap. When the eruption eventually healed the child developed strumous symptoms, and the health began slowly to decline; the face shrank in size, and the veins in the head were fuller; sleep at night was restless and unrefreshing, and food was refused. After several convulsive seizures an attack of meningitis supervened, and death occurred in the course of a week. No post-mortem was allowed.

These cases I now regard with caution, and prefer the continuance of a mild skin affection, even if disfiguring, to the dangers incident on suddenly healing it.

If there is any tendency to vomiting or headache, calomel at the outset is the best remedy, as it is retained on the stomach when other drugs are expelled. Excellent effects have now and then followed the employment of the Liq. Hyd. Perchlor. in fifteen or twenty minim doses three times a day. It may assist in promoting absorption, and if there is any suspicion of syphilis it will be the more serviceable. With regard to depletory measures we have to remember that the subjects are delicate and of strumous constitution, and therefore the administration of mercury and purgatives, important as they may be at the onset, will need great care and judgment as the disease advances. Whatever is done in this way must be done early. The same remarks, as in simple meningitis, are applicable to leeches; they require to be employed with the utmost caution, and are only of use in the early stages of the affection, even if they are then demanded. If employed at a later stage, when the mind is getting confused, and there are convulsive movements, the loss of blood will hasten the fatal issue.

Cold to the head, especially the ice cap, when there is active congestion in the early stages, as I have previously recommended, is a remedy of great value.

In the stage of effusion, when there is restlessness and sleeplessness, iodide and bromide of potassium will be found valuable because of their power in diminishing excitability and tranquillizing the nervous system. These two remedies given together may control secretion, and even favour absorption if it has occurred. Bromide of potassium administered alone is capable of lessening reflex action, of controlling convulsive seizures, and of reducing to some extent arterial tension and vascular excitement, when the more depressing action of chloral might be considered hazardous. Morphia or an opiate in some form may be required when there is excitement and wandering, and the little patient can obtain no sleep. But great caution is necessary in administering these remedies from the cerebral activity to which they give rise at first, and the danger of subsequently depressing the circulation, and lessening respiratory action. Opium acts equally upon every nerve-cell, and also equally upon every nerve-fibre ; * * * it not only lessens cerebral receptivity, but it also deadens nerve conductivity.[*] A sedative will sometimes be borne well after the action of calomel and purgatives, if there be scarcely any heat of the head, and the pulse be quick and feeble.

There is a *variety of acute and chronic meningitis* attacking the base of the brain (*basilar meningitis*) very well described by Dr Cross, of New York.[†] In the adult it is not common. In forty-seven cases of this localised affection, forty-three were acute, four only chronic, as proved by post-mortem examination. Gintrac says, "This species is distinguished by its seat at the inferior surface of the brain, by its circumscribed extent, and especially by the relation of the affected part with the central region and with the cerebral ventricles."[‡] The symptoms depend on the intensity of inflammation, as well as on its seat and extent. When a small portion of the membranes at the base of the brain are involved, the symptoms are not so severe as when a larger extent of brain is implicated. Thus, the optic nerve of one side may be atrophied, whilst the other is normal, and the inflammatory exudation or softening may extend to the third, fourth, fifth, sixth, seventh, or eighth pair of nerves, and so set up a different set of symptoms—symptoms of a local character, shifting from one side to the other. The third nerve, in the majority of cases of basilar meningitis, is paralysed.

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[*] 'Brit. Med. Journ.,' vol. i, 1876, p. 16.

[†] "On Chronic Localised Basilar Meningitis," 'Psychological and Medico-Legal Journal,' April, 1875, p. 220.

[‡] 'Maladies de l'Appareil Nerveux,' vol. ii. Paris. Quoted from Dr Cross.

In thirteen cases recorded, the third nerve was partially paralysed in nine, and in most cases on the left side; in nine cases there was strabismus, and in five of these it was external and on the left side; the pupils were dilated in eight cases, and contracted in one; there was obscureness of vision in four; ptosis in five; blindness in one case; in another loss of sight in both eyes. Headache was a prominent symptom, not confined to any particular locality, in twelve cases generally severe, dull, and throbbing, and ushered in gradually; once it was developed suddenly. Vertigo was present in seven cases, paralysis in eight cases. In acute cases, paralysis is the exception, exclusive of the muscles of the eye. In the chronic form it is most frequently marked.

Chronic basilar meningitis is very prone to change its position from one side of the head to the other. The symptoms may be well defined on the left side, as ptosis, strabismus, dilatation of the pupil of the left eye, and headache may be marked on the left side. These may disappear, and the paralysis be cured, and after the lapse of three months the patient may have the same symptoms on the other side. In one case the disease was ushered in by epileptiform convulsions, and once by loss of consciousness. Anæsthesia was present in six cases, sometimes confined to one side of the face, generally to one arm or leg; once in the left limbs, and in the right arm; hyperæsthesia in no instance. The above are the most important symptoms of chronic basilar meningitis; but the following symptoms are related in the thirteen cases alluded to:—vomiting, twice; thirst, thrice; trismus, thrice; fever, once; supination, once; opisthotonos, twice; nausea, once; eyes closed, twice; coma, once; dyspnœa, once; convulsive movements, once; aphasia, once. The chronic form is most common between the ages of twenty-five and thirty-five; the acute most frequent between one and ten years of age.

The diagnosis is sometimes attended with perplexity, as there is no one pathognomonic symptom we can rely on. The ophthalmoscope is a great aid to diagnosis; and if the eyes are in a normal state, and there is no disease of the orbit, we may reasonably conclude that the disease is central. The difficulties, however, are not so great as they are sometimes made to appear, for in nearly all cases I have seen of chronic meningitis, or tubercular meningitis, there are symptoms present that point to the base of the brain as involved in the irritation, and I have never seen a case after death where the post-mortem has not revealed exudative changes in the latter situation. This exudation of coagulable lymph may have an affinity to gather round the great nerves, at the base of the brain. Even where tumours or cysts in the brain are supposed to be present, or softening, or embolism, or hæmorrhage to have happened, the duration of the symptoms, the localised pain, and the implication of nerves would assist the diagnosis.

Chronic hydrocephalus, or dropsy of the brain, consists in a collection of serous fluid within the head. It may commence in utero and seriously impede the progress of labour, when it is termed congenital hydrocephalus, or the head may not begin to enlarge till after birth. In most cases the fluid is effused into the ventricles (internal hydrocephalus), but it may collect between the dura mater and the cranium, or between the dura mater and the arachnoid, or between the latter membrane and the brain—external hydrocephalus.[*] Wherever the accumulation takes place the symptoms are nearly if not quite alike in all instances. Where it is effused between the arachnoid and the brain the effect is to flatten the convolutions, if not to obliterate them, and to expand and increase the width of the head, which also becomes elongated, and the base of the skull depressed and hollowed out. When the accumulation takes place in the ventricles, the brain becomes thin, and if the fluid meets on the two sides, the hemispheres are pressed asunder, and the distension stretches the pia mater so that it can scarcely be seen, the cerebral tissue being infiltrated by the effused fluid, becomes soft and pultaceous, and otherwise altered. The bones entering into the formation of the skull become thin and friable from the diminution of bony matter, and ossification is incomplete at the anterior fontanelles, and along the line of the coronal suture. The water may go on increasing till the sutures separate, and the ventricles become distended with as much as three pints of fluid, without any water exterior to the brain. Such a case is related by Dr Underwood.[*] The effusion is greatest in the earlier months of life, and lessens or remains stationary as the child grows older. When it is congenital, it is due to some morbid state of the membranes, or ventricles of the brain, and is either observed at birth or soon after.

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[*] "Of 200 cases of hydrocephalus I have found 100 to be of the internal variety, 80 to be œdema of the pia mater, 10 to be cases of external hydrocephalus, and 10 cases of simple cerebral œdema."—*Steiner's Diseases of Children*, by Lawson Tait, p. 44.

The fluid consists chiefly of water; traces of albumen, phosphate and carbonate of lime, and potash are found. It is transparent or slightly yellowish, and the specific gravity is lower than the serum of the blood from a deficiency of solid constituents. In the well-known case of Cardinal, who was hydrocephalic from infancy, and attained the age of twenty-nine years, the composition of the fluid was found to be—

Specific gravity	1011—38.
Water	982·6
Albumen	6·0
Chloride of sodium	7·0
Soda	1·4
Urea and osmazome	3·0
Sulphuric acid, lime, potash	a trace.
	1000·0[†]

Causes.—The disease is frequently hereditary, and is met with in the families of drunkards, and those affected with syphilis and consumption. Children labouring under mesenteric disease are liable to be attacked, and dentition is an exciting cause, as also rickets, by preventing or retarding the ossification of the skull; an attack of bronchitis or diarrhœa will awaken the disease in a child predisposed to it, and some parents profess to trace it to a troublesome catarrh. Excess or deficiency of blood in the brain, impeding the cerebral circulation; hæmorrhage into the sac of the arachnoid, morbid growths, or a slow form of inflammation, have been enumerated as common causes.[‡]

Symptoms.—Some enlargement of the child's head before the health begins to fail is generally the first symptom to attract notice, but a strange movement and unsteadiness of the eyes, which is set down to gastric disorder, may be among the early indications. In some instances nothing is observed till a convulsion happens, and from that moment some marked signs ensue. The face has an old and shrivelled look, and is very small when compared to the size of the head, the chin being pointed, and the angles of the lower jaw sharp in outline. The appearance of teeth is delayed, and children often reach their first year without any traces of them. The eyes at an early stage have a slow rotatory movement, and the veins of the head become distended, as though about to burst when the child cries; the skin of the neck and body is loose and wrinkled, and the stomach is noticed to be large, whilst the extremities waste; the bowels are irregular, being sometimes constipated and at other times loose; the motions are light or dark and offensive, or clay-coloured and sticky, or they are greenish and contain undigested matter like curdled milk. There is apparent discomfort about the head, and the child is constantly raising his fingers to his eyes, or passing his hand across his forehead; he is frequently sick during the day, and retains nothing on his stomach. In some cases the appetite is ravenous, and the child is only quiet when he is eating; in other cases the appetite will depart for days together. Having reached this stage there are striking changes to be observed in the size and shape of the head. It may have been noticed to be larger at birth, or to have commenced to grow disproportionately within a fortnight; but notwithstanding this, the child may be plump and healthy-looking, able to suck, and apparently well nourished. Soon, however, and frequently between the ninth and twelfth month (when the mother leaves off suckling, or the diet is changed) nutrition is interfered with, and the child begins to lose flesh and grow weakly. If he is older, and has been able to walk, he totters, and his legs cannot support him; he is wearied after exertion, and falls off to sleep in the daytime, and is unable to support his head; he is uneasy and restless at night, and the pillow has a wet circle where the head has laid. As the cranial bones yield to the increasing fluid, the veins of the scalp become distended, the temples sink in, and the forehead is arched, whilst the anterior fontanelle is open, and the frontal bone itself is only completely ossified at the lower half. In one case under my care two large veins ran down the groove, and when the child cried they looked about to rupture. As the effusion advances, the parietal and frontal bones become more separate, and their edges are to be felt if the distension is moderate; the eyeball is lowered, and the sclerotic between it and the upper eyelid is very noticeable, whilst the lower eyelid partially conceals the pupil. If the fluid increases rapidly the child may become drowsy and heavy, and symptoms of compression ensue, followed by squinting, convulsions, irregular pupils, and coma. In the course of hydrocephalus, before the head is much enlarged, Dr West has noticed in several instances spasmodic attacks of difficult breathing and crowing inspiration like spasmodic croup.*

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[*] 'On the Diseases of Children,' by Dr Davies, 1846, p. 373.

[†] 'Jones and Sieveking's Pathological Anatomy,' by Dr Payne, p. 248.

[‡] West, 'On Diseases of Children,' 4th ed., p. 11

Treatment.—This is a most unsatisfactory disease to treat at whatever stage it comes before us; not, however, that it is always incurable, as instances of recovery are recorded, and hydrocephalic children have reached manhood. Where the cerebral functions are not seriously implicated, and convulsions and paralysis do not arise in the course of the disease, we may hope for benefit from treatment if we see the case early, and the child's constitution is tolerably robust.

If there be restlessness, great heat and turgescence about the vessels of the head, leeches have, according to some authors, been repeatedly used with advantage, but I have never observed any benefit follow their employment

The strenuous employment of mercurial inunction for weeks, in the shape of one or two drachms of the mild unguentum hydrargyri, rubbed in daily over the shaven scalp, has proved beneficial. It is a plan recommended by Professor Gölis, of Vienna, and approved of by Dr West.† The head is to be kept constantly covered and protected from the cold by means of a tightly-fitting flannel cap. A quarter to half a grain of calomel is to be given twice a day, unless diarrhœa comes on, when it is to be discontinued, and inunction alone trusted to. If at the end of six or eight weeks no benefit results, diuretics and other remedies are to be used, and issues or blisters applied to the back of the neck. A very instructive and apparently hopeless case is recorded by Dr Underwood.‡ After leeching and purging, two drachms of strong mercurial ointment were rubbed in daily for three weeks, and a powder consisting of a grain each of squill, digitalis, and calomel was given night and morning. An improvement soon commenced and gradually continued; the child passed through dentition well, and at twenty-one years of age was a fine young man. Mercury, like other exhaustive measures, must be used with the utmost caution, as prostration of strength is easily induced. Where the symptoms are chiefly cerebral, and the child is well nourished, mercury is best tolerated; but if there is much wasting and emaciation, and the pulse is feeble or irregular, it cannot be trusted to. Looking at the cases as a whole, I have found small doses of the hyd. c. creta of benefit continued every night for a week, and then left off for a short time and resumed again. If the strength is equal to it I prefer the sixth of a grain of calomel night and morning for a few days, when the head often becomes cooler, and congestion and sickness are relieved. Where mercury appears to be indicated, we may obviate the dangers of depression by employing small doses of the solution of perchloride of mercury with the tincture of cinchona. As in some other cerebral affections it will be found a valuable combination.

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* Op. cit., p. 120.

† Ibid., p. 128.

‡ 'Diseases of Children,' by Dr Davies, 1846, p. 374.

If diarrhœa or bronchitis should arise (not infrequent complications) they must be subdued before any active measures are adopted, or the child may die of convulsions or syncope.

The iodide of potassium is another remedy on which I repose considerable faith in the management of these cases; it is of undoubted value where there is irritability, and the head is slowly getting larger; it should be given in small doses, one or two grains three times a day, in a little syrup and water, and then it does not disorder the stomach and cause sickness, as it might do in larger doses. A few drops of sal volatile may be added to obviate any depression. In cases complicated with secondary syphilis and affections of the periosteum and joints, it is a valuable alterative, lessening irritation of the cerebral membranes, and promoting the absorption of chronic or inflammatory effusion. If there be restlessness and headache, then a few grains of the bromide of potassium may be advantageously added to it.

Compression is a remedy suggested on the view that a certain degree of pressure is conducive to health. It can only be safely employed when the disease is chronic and stationary, and there are no active signs of cerebral disturbance. When the child is pale and languid, and fluctuation is distinct between the imperfectly ossified bones, the head may be strapped. Narrow strips of plaster are made to encircle the head from one mastoid process to the other, and from the nape of the neck to the root of the nose. If symptoms of pressure at the brain or heat of head follow the application they must be loosened or removed altogether. Whilst this local treatment is being carried out, the functions are to be stimulated by diuretics, alteratives, and an occasional purge. Preparations of iron and cod-liver oil are generally needed, sooner or later.

Paracentesis capitis.—This should be done at the coronal suture with a fine trochar and canula below the anterior fontanelle, avoiding the longitudinal sinus and large veins, gradually withdrawing the fluid and keeping up pressure on the head as it discharges, lest the pulse becomes weak and feeble, and the child faint.* I knew of one case in the practice of a medical friend in which a cure was said to have followed this method, but I have had no such experience myself, and I should be reluctant to adopt it unless all other means had failed. A successful case of paracentesis capitis is recorded by Mr Thompson, of Newcastle-on-Tyne, in a child eleven months old, who made a good recovery after the operation.†

Hypertrophy of the brain generally occurs in early childhood whilst the brain is growing. It is supposed to be due to some constitutional state, allied to rickets, swelling of the lymphatic glands, anæmia, scrofula, &c. Dr West has generally seen it in infants of six or eight months old.‡ Most of Steiner's cases occurred about three years of age.§

Symptoms.—These are loss of appetite and failing strength, general uneasiness and frequent startings in sleep. The child loses its cheerfulness, and the head hangs backwards or to one side, as if too heavy to be supported by the muscles. It becomes covered with perspiration, as we often see in rickets, and epileptic fits and convulsions are not uncommon. As the case goes on, the child loses flesh, and becomes more impaired in health, headache and giddiness occur during the day, and sleep at night is restless and disturbed. Sometimes improvement takes place as the child grows older, and the health is re-established, but in other cases the pain in the head increases, and imbecility, or complete idiocy, has been known to ensue. Death is seldom the direct result of the brain affection, but it usually happens from the supervention of some acute disease as whooping-cough, or the exanthemata. On the other hand grave cerebral symptoms occasionally set in during the progress of the disease, as sluggish and dilated pupils, strabismus, irregular respiration, vomiting, unconsciousness, convulsions, followed by coma and death.

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* 'Medical Times and Gazette,' March, 1838.

† 'Med.-Chir. Trans.,' vol. xlvii, p. 292.

‡ 'Diseases of Infancy and Childhood,' 7th edit., p. 141.

§ 'Diseases of Children,' 1874, p. 43.

Diagnosis.—Hypertrophy of the brain is the most likely disease to be mistaken for chronic hydrocephalus, but there are many points of difference. In the former affection the symptoms come on more gradually, and the cerebral disturbance is not so great as in the latter. In hypertrophy the posterior part of the skull is first enlarged; in hydrocephalus the forehead first becomes prominent and overhanging, the direction of the eyes is altered, and the sutures and fontanelles are more widely open than in hypertrophy. In hypertrophy the head never attains the same large size it does in hydrocephalus; in hypertrophy the head is thrown backwards, and the child lies horizontally; in hydrocephalus the child lies on its stomach with the head lower than the rest of the body; in hypertrophy the face is puffy, the eyes inexpressive, and the mouth half open; in hydrocephalus the countenance is withered and the expression prematurely old. In hypertrophy, after death, although the convolutions are flattened and the cerebral membranes stretched, not a drop of fluid is formed in the ventricles.

Pathology.—The hypertrophy appears to be owing to an increase of connective tissue, and not to overgrowth of the brain substance. When the skull-cap is removed the brain appears to expand, as if it had been too large for its containing cavity, the convolutions are flattened, and the ventricles contain no fluid. The brain in hypertrophy generally presents an anæmic appearance. The grey matter is unaltered, the white matter is increased, and is also paler and firmer. There is no increase in the number of nerve-tubes, nor any enlargement of them, but an excessive development of the intervening substance or neuroglia.* The changes are limited to the hemispheres, the cerebellum and base of the brain not being involved.

Treatment.—This consists in making every effort to improve the general health by a carefully regulated diet; the bowels must be kept open, and bark, cod-liver oil, and preparations of iron given as the case may seem to demand. If there be attacks of headache, and signs of cerebral congestion, the local abstraction of blood by leeches may be called for. A daily sponging bath of sea-water or tan-water, or Tidman's sea-salt will be found serviceable, and, if possible, a residence at the sea-side. Some comfort is obtained by a horse-hair cushion with a hole in the centre for the child's head to rest upon, as recommended by Dr Elsässer.

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* 'Jones and Sieveking's Pathological Anatomy,' by Payne, 1875, p. 272.

Partial hypertrophy of the brain occasionally takes place where one hemisphere, one thalamus, or one corpus striatum has been found larger than its fellow. These cases are probably congenital.

Atrophy of the brain, the converse of hypertrophy, is sometimes met with in children when exhausted by long-standing illness. The brain does not fill the cranial cavity, and serum is effused between it and the membranes. The convolutions are thinner, and the sulci between them are more widely separated than in health. Cases of *partial atrophy* have been recorded.

CHAPTER XLII

EPILEPSY

DEFINITION OF—*Influence of age and sex.*—VARIETIES OF—*Epilepsy proper or idiopathic epilepsy—Epileptic vertigo—(Epilepsia gravior—Le grand mal)—Slight epilepsy—(Epilepsia mitior—Le petit mal).*—SYMPTOMS—*Of the true or idiopathic form—Duration of the fit—Headache and vertigo—Night alarm in children—Character of the urine—Aura epileptica—Its nature—Association of epilepsy with chorea—Perversion of the moral sense—Le petit mal a less severe and frequent form than le grand mal—Slightness of the spasms.*—CAUSES—*Predisposing and exciting—Hereditary influences—Weakness of the nervous system—Syphilis—Rickets—Heart disease—Phthisis—Tumours of brain—Injuries of the head—Relation to carpo-pedal contractions (congenital talipes).*—MORBID ANATOMY—*Congestion of the brain—Thrombosis or embolism of the small cerebral arteries—Exalted sensibility of the medulla oblongata.*—DIAGNOSIS—*From hysteria—Paralysis — Convulsions — Difficulty in forming a differential diagnosis between le petit mal and epileptiform seizures—Resemblance to eclampsia—Means of distinguishing the two convulsive attacks—Epileptiform seizures— Symptoms and diagnosis from true epilepsy—Resemblance in some cases to attacks of angina pectoris.*—PROGNOSIS—*Favorable in early life when the cause admits of removal—Unfavorable when the constitution is syphilitic or scrofulous, or there is a history of nervous disease.*—TREATMENT—*During the fit—In the interval—Attention to the digestive organs—Removal of all sources of irritation—Purgative medicines—Counter-irritation—Importance of hygienic treatment—Care in education—Bromide of potassium—Iron—Iodide of potassium in syphilitic cases—Nitro-muriatic acid—Phosphorus—Ergot*

—*Oxide of zinc*—*Prophylactic measures*—*Hyoscyamus*—*Digitalis*—*Belladonna.*

It is well-nigh impossible to frame the definition of a disease so variable in its manifestations as epilepsy, the severe forms bearing but a faint resemblance to the milder varieties of this affection.

Epilepsy consists in the occurrence of fits at more or less regular intervals with entire loss of sensibility and consciousness. In its severe form it is accompanied with general convulsions and spasmodic contraction of the voluntary muscles. It is frequently followed by deep sleep or coma. Males are said to be more subject to the disease than females, but Russell Reynolds considers the two sexes about equally liable. Except when occurring in imbeciles, severe epilepsy in children is of very serious omen.

Of 1450 cases mentioned by Dr Gowers, 12½ per cent. commenced during the first three years of life, and under ten years of age, 29 per cent. The number of cases was largest in the first year (5½ per cent. of the whole). From three to five years only 1·7 per cent. The scale rises in numbers at seven, or about the period of the second dentition. The maximum is reached at fifteen and sixteen, 5¾ per cent. of the whole number.*

It is important to remember that the spasmodic action may vary from slight twitching of the arm or leg to the most severe convulsion, and that the degree of consciousness may range from mere bewilderment and confusion of ideas to the most profound coma.

Epilepsy is divided into two varieties. 1. Epilepsy proper or idiopathic epilepsy (Le grand mal). 2. Slight epilepsy (Le petit mal).

Epilepsy may be centric or excentric. When centric it may depend upon irritable areas in the brain ; irritable by some inherited tendency, or some accidental injury or morbid growth. When of excentric origin it may arise from peripheral irritation, as a tapeworm in the intestines, or some abnormal condition of the viscus.

The epileptic discharge, though single, if severe may produce the same shock to the rest of the brain, as is the common result of a series of rapidly repeated fits ; the "*status epilepticus*" or condition of complete prostration following a series of repeated fits is strictly analogous to the condition of exhaustion produced in the electric eel (Gymnotus) after repeated discharges, or the condition of fish after the explosion of gunpowder or dynamite in a pool.

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* 'On Epilepsy,' 1881, p. 13.

Death from the first epileptic discharge is exceedingly rare. When it does so take place, the brain and membranes are found enormously congested if the seizures are prolonged. The heart is arrested and brought to a standstill, either from exhaustion due to the violence of the fit, from paralysis of the medulla, or from the circulation of carbonised blood producing asphyxia.

The *symptoms* of the so-called true or idiopathic form of epilepsy are sudden loss of consciousness, "a paroxysmal loss of consciousness" (Hughlings Jackson), the patient frequently screams out in a loud voice, as if alarmed or terrified, and usually falls with his face forward to the ground in an instant if standing up or walking across a street or room. He may, however, fall backwards or to one side. Proximity to fire or water at any moment may put his life in jeopardy. He is likewise at the risk of injuring himself by coming in contact with some hard body or sharp surface. Cuts and bruises are common enough under these circumstances. Terror and a sense of fear frequently precede an atttck. In the seizure the child throws his arms about and kicks violently; the muscles being tense and powerfully contracted; the convulsions may be general, but as a rule, one side of the body is more affected than the other; the eyes are wild and fixed, or so hidden by the upper lids, that the sclerotic is only exposed. The pupils are usually dilated and insensible to light, but at an early stage they are often contracted. The pulse varies; it may be scarcely perceptible, or not altered from health, whilst the heart is felt to be violently beating and the carotids are equally active. The expression is greatly distorted; the face is pallid at first, from tonic contraction of the vaso-motor nerves, but it soon becomes livid, and the superficial veins, including those of the head, are turgid, and the muscular coats of the blood-vessels are involved in spasm. Sometimes mucus mixed with blood issues from the mouth. Small extravasations of blood on the surface of the face and forehead are occasionally seen resembling petechiæ. The tight closure of the jaws often causes the patient to bite the tongue or the under lip. The contraction of the flexor tendons is always great, the fingers being clenched in the palms of the hands, the foot arched, and the toes bent.

The insensibility may be so profound that the patient cannot be roused by any means at our command, and even reflex action cannot be excited in severe cases by tickling the feet, or irritating the conjunctiva. When the paroxysm has subsided, the skin is bathed in perspiration, consciousness returns, and the patient may seem none the worse for the seizure; but in many cases there follows profound sleep, and on awaking the child may be torpid, and his memory and ideas confused for a day or two. He complains of frontal headache, and the features are so congested and bloated as to be almost characteristic. Headache and vertigo are the two forms of disturbance the most frequently complained of by epileptics.[*] Headache is common both before and after the seizure. Dr Sieveking met with it in 56 out of 104 cases. He speaks of it as "*Cephalalgia epileptiformis*,"[†] and says, although the pain may affect any part of the head it chiefly attacks the vertex. In the cases I have observed there have been the usual characters of congestive headache from excitement of the circulation and fulness of the cerebral vessels.[‡] Sometimes the contents of the bladder and bowel are passed involuntarily during the fit. The tonic convulsions continue for a few minutes, and then pass away, leaving the muscles more or less flexed and extended. Sleep may continue for some hours afterwards, the muscles being completely relaxed or tremulous. The fit usually lasts two or three minutes altogether, but it may continue for a quarter of an hour. In some cases of epilepsy the patient is no sooner free from one fit than another supervenes. When this happens, the brain suffers from these repeated shocks, and in the intervals of the paroxysms the child is torpid and prostrate. There may be several fits in the course of the twenty-four hours, or the interval may extend over months or even years.

The night terrors, or nightmare in children is supposed to be often an incomplete epileptic attack. They go to bed as usual, and after falling asleep, wake up screaming and in terror; they stare wildly about at some imaginary object and are bathed in perspiration. After sobbing and crying for some time they fall back exhausted and drop off to sleep. On waking in the morning they have no recollection of these nocturnal seizures.[§] A child aged three years, suffering from rickets and cerebral exhaustion, was under my care in November, 1879, and the nurse found him night after night in the condition described, but he never had a genuine convulsion or epileptic paroxysm. Bromide of potassium and henbane relieved the symptoms.

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[*] 'A System of Medicine,' article "Epilepsy," by J. Russell Reynolds, M.D., vol. ii, p. 313.

[†] 'On Epilepsy,' 1861, p. 56.

[‡] 'On Headaches,' by W. H. Day, M.D., 1880.

[§] "Lectures on Diseases of the Nervous System," by Julius Althaus, M.D., 'Medical Examiner,' Feb. 7th, 1878, p. 112.

The *urine* is frequently pale and of low specific gravity; generally it is normal, but I have met with it as high as 1034 in an epileptic child. In some cases it contains an abundance of phosphates, alternating with lithates. Dr Sieveking has often seen oxalates, and repeatedly such a large quantity of urea, that the whole of the liquid, on the addition of equal parts of nitric acid, has become solidified by conversion into urea.* On the whole the excretion of urea does not seem to be increased, nor is there any constant change in the urine. Traces of albumen have been found, and in extremely rare instances a faint trace of sugar.†

An epileptic seizure does not always commence in the same way. Before the attack, in some instances, there is pain in the stomach, nausea, or vomiting, headache, and restless sleep. In other cases there are pain in the præcordial region, and palpitation of the heart, bright colours appear before the eyes, there are noises in the ears, and nervous apprehension. The patient often looks wild or vacant, and the mouth and lips are in constant movement. If the tongue is protruded there may be seen on its surface a foamy saliva, which is not infrequent among adults who suffer from nervous disorders. Children particularly show the alarm they experience by running to and clinging to their nurses and mothers.‡ A peculiar feeling of cold, or tingling, or numbness, or vapourish sensation, creeping from the lower extremities, is felt along the spine to the back of the head (termed the "*aura*"), when the patient becomes insensible, and falls down in a fit.

The *aura epileptica* is a curious physiological phenomenon which indicates the approach of the paroxysm. It is a premonitory symptom, occurring in about one-half the cases, and is subject to much variation in its character. Sometimes it is motor in its origin —convulsions seizing on a certain set of muscles, as those of one arm, or leg, or foot, or finger. Many years ago, a young lady came under my notice, where the paroxysm was preceded by incessant tremor of the right leg. She called out, "I am going to have ague!" and then the fit followed. There was probably vaso-motor disturbance, and a sense of chilliness at the same time extending upwards from the limb to the brain. Some auræ seem to involve the nerves of special sense, as when offensive, strong, or disagreeable odours excite a paroxysm, or flashes of light are seen before the eyes. Occasionally the aura may be visceral, as when it affects the stomach, heart, or intestines. Any sudden shock, as calling aloud, tying a ligature round the limb, or giving a stimulant, may arrest a seizure even when the aura is present.

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* 'On Epilepsy,' 1861, p. 119.

† Gowers, op. cit., p. 107.

‡ Sieveking, op. cit., p. 19.

Dr Handfield Jones mentions the case of an epileptic boy, 13 years of age, in which the fits began with a sinking sensation of the stomach, then giddiness and falling down, but there was no unconsciousness. After a "fright" he got well marked chorea, but he was free from epilepsy. The author remarks that "the transmutation of the malady into chorea is a point of much interest, marking the affinity which subsists between the several neuroses."* The aura or reflex action in such a case would probably travel to the medulla oblongata by means of the sympathetic and pneumogastric nerves. There is a similar relation to asthma.

Not unfrequently the disease is preceded by a voracious appetite or constipation, in others, on the contrary, by a total dislike of food. In most cases there is no notice of the fit before it occurs. Agitation and excitement are instantly followed by swimming in the head, the room appears to go round, and the patient falls down.

An epileptic fit may be preceded or followed by spitefulness, anger, and violence. The child is shy, fretful, suspicious, wilful, disobedient or morose. Dr Sieveking has observed thieving propensities and other mischievous tendencies, such as setting fire to dwellings. Dr Althaus has recorded a case, in a boy of 7, who had regular attacks of destructiveness, tearing sheets, blankets, clothes, and everything within his reach. "After a particularly bad outbreak he was put in a straight waistcoat, and managed to tear it to pieces with his teeth."† In another case under his care, a girl of 9 was a "fearful liar," stole money, and was daring and defiant. A girl, 9 years of age, was brought to me by her mother, in 1872, who was in the habit of suddenly rushing at her sisters and brothers before the paroxysm, and biting them, after the fashion of a ferocious dog which had been teased and irritated. The arms of one sister showed indentations caused by the patient's teeth.

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* 'On Functional Nervous Disorders,' 1870, p. 293.

† 'Medical Press and Circular,' July 16th, 1879, p. 45.

The *petit mal* is a less severe and frequent form of epilepsy, consisting in giddiness and confusion of ideas, or sudden and transient loss of consciousness, accompanied with symptoms of faintness or of syncope. There is slight convulsive movement of the facial muscles, eyes, and hands, or may be not even this, followed by stupor and sleep. The patient may stagger, and fall down, or exhibit such a wild and vacant look that a bystander thinks a fit is about to happen. When the convulsions are severe, and the insensibility is complete, with biting of the tongue and foaming of the mouth, the diagnosis of epilepsy is easy enough, but epileptic vertigo with partial suspension of reason is apt to perplex us. In some of these attacks the spasm is scarcely obvious. The respiration may be momentarily suspended, and the face at first pallid becomes livid, whilst the urine is frequently discharged during a seizure. "A boy, 10 years of age, had been subject to fits for two years. At the first they were so slight that his mother said they thought he was in a 'deep study;' he used to sit 'as if he were thinking.' The attack was only of a few seconds' duration, and no alteration of complexion was noticed. Later on in his fits he would turn up his eyes—slight spasm of very small muscles. Later still, there was, besides this, occasional shaking of the body (imitated before by tremor). I saw one. Whilst sitting the boy blinked his eyes; he did not alter in colour; he then drew in a deep breath, and rapidly all was over. The paroxysm was so sudden and short that I could not make any special investigations. Attacks of epilepsy may be so light that strangers sitting opposite a patient at dinner may observe nothing, although there is absolute, though transient loss of consciousness."* These slight seizures may come and go, and then be replaced by the severe form of epilepsy. "Le petit mal" may occur with or without spasm. In the former there is a sudden or temporary loss of consciousness lasting for a few seconds, and then passing off without the patient knowing that anything has happened. In the latter there may be slight spasm of the facial or laryngeal muscles, or the spasm may be brief and slightly involve the whole voluntary muscles of the body. "The most common combination and degree of symptoms may be thus described, a feeling of giddiness, faintness, or discomfort; slight twisting of the neck with anxious lachrymose expression of the face, dilatation of the pupils and pallor; accompanied, or quickly followed by entire loss of consciousness, which lasts for two or three seconds; the patient becoming himself again after making a few sighing sounds, but feeling faint and bewildered, and often perspiring freely."[*]

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* Dr Hughlings Jackson, "On the Diagnosis of Epilepsy," 'The Lancet,' 1879, vol. i, p. 43.

The *causes* that predispose to epilepsy are various. The disease can often be traced to hereditary influence, the parents or some member of the family having suffered from it; or there is a history of insanity or some other neurosal affection—such as an originally weak or susceptible condition of the nervous tissue, liable to morbid action. Long continued debility and gastric irritation, or any source of exhaustion as chronic diarrhœa, albuminuria, &c., are among the factors which lead to the epileptic paroxysm. Hereditary syphilis is another cause. Rickets would also appear to be a cause just as it is of eclampsia. Three fourths of the cases of epilepsy, dating from infancy, are believed to be the consequence of rickety convulsions.[†] The relation between heart disease and epilepsy is also very close, as out of sixty-six cases observed by Dr Gowers, in which the two diseases were conjoined in twenty-five, there was mitral or aortic disease.[‡] He thinks the cardiac disturbance is due to one of three causes. 1. Irregular action. 2. Simple dilatation. 3. Valvular disease. These several conditions would appear to be either the consequence of the epileptic paroxysm, which puts a violent strain on the heart, or the fits arise from the cardiac affection.[§]

In a boy, 9 years of age, who came under my care in 1875, there were the symptoms of pulmonary consumption. I have observed the connection before, though not often enough to justify me in saying that it is more than casual. The association is considered to be accidental by the best authorities. Phthisis is far more common than epilepsy, and when the two diseases occur together there is probably a state of the nervous system which readily invites an epileptic paroxysm. The patient had been losing flesh and strength, was much wasted, and coughed chiefly at nights. Whilst under treatment a fit occurred for the first time, lasting an hour and a half. This was followed by hæmoptysis to nearly a pint, with the physical signs of tubercular disease of the lungs.

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[*] 'A System of Medicine,' article "Epilepsy," by J. Russell Reynolds, M.D., vol. ii, p. 303.

[†] "On Some of the Causes of Epilepsy," by J. R. Gowers, M.D., 'Medical Society's Proceedings,' vol. iv, p. 259.

[‡] Ibid., p. 259.

[§] "Heart Disease and Epilepsy," 'Brit. Med. Journ.,' 1877, vol. ii, p. 730.

The *exciting* causes are fright and terror, outbreaks of passion, masturbation, and intestinal worms. "A boy, 13 years of age, was frightened a year ago by a snake; a month after the fright he had a strong epileptic fit. He is now a confirmed epileptic; his manner is sullen and dogged, he refuses to take his medicine, 'because he does not like it;' he has on several occasions threatened his sister's life, by brandishing a knife; he presents a physiognomy indicative of mental aberration, and will have to be removed to an asylum. There is no family history of neurosis, and the mental condition appears to have been produced by fright."* In a child, aged 4, who came under my care in 1875 for epilepsy, the fits commenced at the eleventh month, during dentition; another fit recurred at two years of age, and there was an interval of two years before the next came on. The child had enlarged cervical glands, and a severe eruption of impetigo. In another case under my care in 1876, a girl, ten years of age, had an occasional epileptic seizure, which followed scarlet fever three years previously; still there was no kidney disease.

It is also to be borne in mind that there may be a tumour, or an abscess, or a spicula of bone growing from the skull, and irritating the membranes.

An accidental blow may drive down a spicula of the brittle inner table of the skull, or produce a spot of localised inflammation and adhesion which may lead to repeated epileptic fits. A boy received a violent blow on the head from a cricket bat. He did not appear to suffer any inconvenience from the injury until *ten* or *eleven* years afterwards, when he became subject to paroxysmal attacks of headache, associated with extreme vertigo, clearly of an epileptic character. He eventually had a succession of severe attacks of epilepsy, which continued for a period of five years. He ultimately died in a violent epileptic paroxysm.† Many cases of epilepsy are traceable to blows and injuries of the head.

There is a close relationship between the convulsive affections of children and congenital talipes. Operations for the cure of these deformities have been followed by epilepsy. Just as in some adult women, the subjects of hysteria, distortion of a limb will follow repeated paroxysms, demanding mechanical treatment till the irritation subsides. Mr Brodhurst records the following instructive case:—"February, 1852.—I divided the tibial tendons and the tendo Achillis of a strong plethoric infant, fourteen months old, for the removal of congenital varus. Both feet were nearly equally distorted. I had scarcely commenced the operation, when the child, crying violently, was seized with a fit; and I then learnt that, when seven months old, the child had whooping-cough, which was followed by a succession of slight fits; and that, at intervals, on coughing or crying violently, the fits recurred. The feet were after some months perfectly restored, and the supports were at length removed and discontinued. Seventeen months after the operation the child again had a fit, when both feet were drawn into the same distorted positions as at birth. The father of this child was epileptic."*

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* "Phenomena accompanying Epilepsy," by Dr Buzzard, 'Brit. Med. Journ.,' 1877, vol ii, p. 729.

On Obscure Diseases of the Brain and Mind," by Forbes Winslow, M.D., 1860, p. 674.

Mr Wm. Adams has pointed out that it is only in cases of rigid muscles that epilepsy occurs, the muscles being rather spasmodic and spastic than flaccid, as in the truly paralytic class, where they take on fatty degeneration.† The author describes a most interesting case of a boy, 14 years of age, who fell under his care for rigid muscular contraction of both legs, and deformity of the feet. The affection commenced from infancy. "He had been for several years subject to epileptic fits, the continuance of which had, to a slight extent, weakened his mental vigour, although his bodily health remained good. At the time I saw him the fits occurred regularly once a month."‡

Morbid anatomy.—The brain is sometimes congested, and the vessels are too full of blood, but the pathological changes may be entirely negative, there being no relation between them and the violent symptoms that have been noticed during the seizure. Dr Hughlings Jackson thinks there is thrombosis or embolism of the small arteries in most cases; and he bases this opinion on the fact of having found epileptiform seizures common in those patients suffering from valvular disease of the heart. He is of opinion that there is evidence to show that the pathology of the disease is more "arterial" than "nervous."§ There are many cases in which more or less hemiplegia is induced by epilepsy, and it is in these cases that there is probably embolism or extravasation. The frequent presence of external extravasation justifies the view that a similar condition occurs in the brain. The hemiplegia is sometimes very evanescent (Sieveking).

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* 'On Club-Foot,' 1856, p. 57.

† 'On Club-Foot,' 1873, p. 61.

‡ Ibid., p. 392.

§ Op. cit., p. 113.

Schroeder van der Kolk thinks that the loss of consciousness in epilepsy is due to the excited action of the ganglionic cells in the medulla oblongata, which extends its influence to the vaso-motor nerves of the brain; and he believes, moreover, with Kussmaul, that in an epileptic fit the whole brain participates more or less in the change; the commencement of the fit, or of the discharge, is to be referred to the exalted sensibility of the medulla oblongata.*

Diagnosis.—True epilepsy in its severe form, as it ordinarily occurs in childhood, is not difficult of diagnosis; the complete insensibility, the brief duration of the fit, the general convulsions, and the absence of stertorous breathing and paralysis render it impossible to confound it with hysteria or apoplexy. The milder cases, in which there is confusion of the mind, without complete loss of consciousness, where there is reverie or forgetfulness, and peculiar sensations are complained of, the diagnosis is not so easy to establish.

Between le petit mal and epileptiform seizures the diagnosis is often impossible.

Eclampsia is the most likely disease to be mistaken for epilepsy, the convulsive paroxysms being in both instances much alike. There are, however, a few distinctive features which may be considered diagnostic. Convulsions are most common in infancy. They occur in connection with dentition and are repeated frequently; they are sometimes observable at the beginning of acute febrile disorders, and particularly scarlet fever, which does not apply to epilepsy. The latter affection is often very sudden, the child at the time of the seizure being in apparently good health, whilst convulsions are often preceded by some previous illness. In convulsions the movements are more confined to the eyes and facial muscles than to the limbs. The frequency of the convulsive attacks disturbs the nervous centres, interferes with the respiration, and terminates fatally in asphyxia. Children seldom die in an epileptic attack.

Epileptiform seizures resemble the true form of epilepsy in some respects, and differ from it in others. The distinctive features, as pointed out by Dr Hughlings Jackson, are chiefly in respect to consciousness and convulsion. In true epilepsy consciousness is lost the first thing, or very soon after the commencement of the seizure, and the convulsions are also general from the beginning. Epileptiform seizures usually begin with spasm of one hand or foot (or side of the thorax, as I have observed), consciousness is lost later on, or not at all if the seizure is slight; the convulsions are local, or one sided, before they become general. When consciousness is not entirely abolished the symptoms are said to be frequently induced by some organic disease of the brain, as a cyst or tumour, which is not the case with true epilepsy.* A case is related by Trousseau, where a little boy, who died from epileptiform seizures, had tubercles in the brain.†

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* 'On the Spinal Cord and Medulla Oblongata,' New Syd. Soc., 1859, p. 230.

A very excitable and passionate girl, 9 years of age, was admitted into the Samaritan Hospital under my care, with epileptiform seizures, December 30th, 1878. The fits resembled the petit mal. She never fell down, although she would stagger as if about to fall. Before the fit happened she was drowsy, strange, and absent in her manner; she could not speak distinctly, and there was a difficulty in engaging her in conversation. To prevent the possibility of falling she was laid on a bed, when she soon became gradually convulsed, the right arm first, then the right leg, and then the other leg in precisely the same order. If the eyeballs were touched there was no reflex excitement induced; there was no biting of the tongue, and no foaming of the mouth. The face underwent no change in colour, and the pulse averaged eighty per minute. The head shook tremulously from side to side, and the eyes were closed; the tremor would sometimes continue for a quarter of an hour, then it would subside, and the child fall asleep for some hours before a return to consciousness. The arms and upper portion of the trunk of the body were chiefly affected. The patient would have as many as three attacks in one day, then not another seizure for a week; and then an interval of seven weeks elapsed. Every fit was of the same character, but stronger each time. It was not influenced by diet, or any cause that could be ascertained. Bromide of potassium in gradually increasing doses, phosphorus, cod-liver oil, &c., gave no relief. Thirty minims of the tincture of henbane, gradually increased to sixty, in half an ounce of camphor water three times a day, completely arrested the fits during the time she took the remedy. A return of the fits came on when it was omitted, and again departed on resuming it.

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* "Lectures on the Diagnosis of Epilepsy," 'The Lancet,' 1879, vol. i, p. 42.

† 'Clinical Medicine,' 1867, vol. i, p. 62.

The following is a case of interest in which the "aura" was cardiac. The seizures were of a doubtful nature at first, and I was inclined to regard them as due to *angina pectoris*, but they terminated in true epilepsy.* E. B—, æt. 6, was admitted under my care into the Samaritan Hospital on December 6th, 1876, suffering from what her mother called "spasm of the heart when she awoke in the morning." She was a nervous and timid child, and easily moved to tears. In infancy she suffered from convulsions, and ever since then had been periodically subject to these seizures. From the age of two years the attacks had been more confirmed and regular, coming on about once a month. Six weeks previous to her admission she was found insensible in the street by a policeman, and she so continued for three hours. The attacks began with pain over the cardiac region, and a tremulous and throbbing action of the heart, followed by pallor and faintness; the eyes were wild and staring, and if no one was near to support her she would fall. Partial consciousness was preserved. The heart's sounds were normal, and the rhythm regular. Pulse 100; resp. 24; temp. normal. The urine was of high specific gravity (1034), clear, acid, non-albuminous, but containing much urea.

After being under observation for three weeks, the report states that every other morning she had an attack on waking about 7 a.m., which lasted from three to five minutes. There was tremor of the facial muscles, which were partially convulsed. She was put on a milk diet, and ordered a mixture containing phosphoric acid and strychnia. No fit occurred for a month, and then in my presence she suddenly screamed out, put one hand over her heart, and the other against the right wall of the chest, both being firmly clenched. She did not fall. Her eyes were fixed and staring, and she understood nothing that was addressed to her. Her face was slightly reddened, and the lips were compressed, as if in pain. The heart's action was rather tumultuous and thumping, and the pulse was weak and intermitted every fourth beat. The nurse, who had seen her in several attacks, had always felt the heart thump and beat against the thorax at the time of the seizure. A week later, without any previous intimation, she had another and more severe seizure. It began with general convulsive movements of the upper and lower limbs, working of the facial muscles and eyelids, foaming at the mouth, but no biting of the tongue; she tossed and kicked about incessantly for nearly two hours, and then she fell into sound sleep for nine hours. On awaking she was partially conscious, and seemed to recognise the nurse. Every day following, for the next week, there was a fit of a similar character. Tincture of digitalis in five-minim doses was now ordered three times a day, and then the fits entirely ceased for the next month. She left the hospital on March 4th, with directions to continue the remedy which had apparently kept the fits in abeyance.

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* "A good many cases of angina pectoris are certainly a form only of partial epilepsy."—Trousseau's 'Clin. Med.,' vol. i, 1867, p. 65.

Prognosis.—This is favorable when epilepsy arises from any cause which admits of removal, as worms in the intestinal canal, dentition, &c.; but when it happens in children over twelve years of age, and the constitution is syphilitic or scrofulous, or there is a family history of nervous disease, then the complaint may be incurable. The aspect of epilepsy, however, it must be admitted, has been profoundly modified by the introduction of the bromides into our pharmaceutical armamentaria, and cases now yield to their peculiar action, over which other drugs have no controlling or curative influence whatever. If we have approached towards a correct knowledge of the pathology and causes of epilepsy, and our treatment is far more successful than formerly, it still rests on an insecure and empirical basis.

Treatment.—There is no remedy even at the present time that can be positively termed a specific, or that can lay claim to cure this affection. In the management of epilepsy the treatment divides itself into two stages. 1. During the fit. 2. In the interval.

1. During the fit it is advisable to put the child on a bed, if there be one at hand; to loosen all articles of clothing, especially about the neck, and to insert a piece of wood, or india rubber, or even a fold or two of linen rag between the teeth to prevent biting of the tongue. Cold may be applied to the head, and a sinapism to the nape of the neck. When the seizure has terminated the child is usually disposed to sleep, which may be permitted, and when it wakes up, light nourishment may be allowed.

2. In the interval of the fit the aim should be to remove all sources of irritation, as that caused by dentition, worms in the intestinal canal, constipation, congestion of the brain, general plethora, mental emotion, as fits of anger and passion. If there be evidence of plethora and fulness of the cerebral vessels, a non-nitro-

genous diet, sleeping on a hard bed, and purgative medicines will be demanded, especially at an early stage. They should be strong enough to be effectual without diminishing vital power; rhubarb and senna, tartrate of soda, taraxacum, or castor-oil. In some cases a little Hunyadi Janos or Friedrichshall water may be advantageously given in sweetened milk.

Admitting that it is of the utmost importance to diminish or remove the morbid sensibility and congestion of the medulla oblongata, all agents that excite this must be rigidly excluded, and sources of irritation removed in whatever part of the body they may be discovered.

Except for very special reasons, mercury is not to be administered in epilepsy. Where there is a suspicion of worms, or the liver is sluggish, and the chief secretory organs are at fault, a calomel purge by acting as a derivative, and washing away foul matters, will prove serviceable.

Counter-irritation may be necessary in some exceptional cases; but I have never done more in this way than to apply a stimulating liniment to the back of the neck, which is sometimes serviceable, as the compound camphor liniment and cantharides, or the compound liniment of mustard, or the liniment of turpentine and acetic acid.

A highly nitrogenised diet, by increasing the exploding tendency of the irritable areas is very hurtful, and it cannot be too much insisted on to watch children most carefully in this respect. The imposition on the digestive organs of more work than they can comfortably discharge, or the accumulation of indigestible matters in the intestinal tract, impairs the quality of the blood and predisposes to the epileptic paroxysm. Dr Merson has made some interesting investigations on the effects of diet in epilepsy. He put twelve patients, so suffering, on a nitrogenous diet, and twelve on a farinaceous diet, for four weeks. At the end of this time he reversed the plan, those taking farinaceous food exchanging it for nitrogenous, and *vice versâ*. At the end of another four weeks the patients resumed their ordinary dietary. No decided advantages resulted from following either diet, though there was a slight advantage in favour of the farinaceous regimen. The nitrogenous plan seemed to produce more dulness, stupidity, dreaminess, and listlessness. The mental condition improved under the farinaceous diet, the patients being lively and intelligent, again becoming dull and stupid when the diet was nitrogenous, whilst the number of fits increased. A higher rise of temperature was also observed under the latter diet. The urine contained more urea and salts, and was of higher specific gravity under the nitrogenous diet than under the farinaceous. The number of fits was somewhat less under the latter. On the whole, the writer considers there are fair grounds for believing that a farinaceous diet is likely to be less hurtful than a nitrogenous one.* I think this view of the question will be generally conceded, and that we are right in enforcing a plain, simple, and nutritious diet in epilepsy. Milk and cocoa should be taken in preference to tea and coffee, and wine and stimulants strictly forbidden.

The hygienic treatment of epilepsy in early life claims our first attention. All drugs hitherto selected occupy a subordinate rank to those rules and habits of life which must be observed to combat the malady. Whatever conduces to the general health, and keeps the various functions of the body in proper working order, does during the period of growth, exert such a beneficial influence on the nervous system, as to arrest or cure that peculiar condition of it which invites the epileptic discharge.

When the disease is threatening, or it has developed itself, our first duty is to inquire into the habits and life of the child; to remove it if possible from a bad atmosphere to a healthy one, where light takes the place of darkness; to see that the air is pure and invigorating; the sleeping apartment lofty and commodious; and to surround it with all those influences which elevate its mental and moral tone. The children of the poor shut up in the ill-ventilated apartments of London have an indifferent chance of recovery, and we often witness temporary alleviation in those cases which are sent into the country. A seaside residence and high mountain air have proved of incalculable benefit.

Above all, over-excitement of the intellect, in any child who comes of epileptic parents, or who has once had a fit, should be carefully guarded against. The effort to accomplish the routine life of school is a sufficient stimulus in itself to the cerebral circulation, and if there is anxiety added to it, or too much pressure is put upon the child's intellect, the nervous power becomes exhausted, and an epileptic paroxysm is the consequence. Mothers who have the bringing up of excitable or epileptic children, should in this age of pressure and progress encourage mental rest. During the early years of life, when physical growth is most active, and the brain is undergoing expansion and rapid changes, we cannot be too careful in not overtaxing the intellect.

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* "On the Influence of Diet in Epilepsy," 'The West Riding Asylum Lunatic Reports,' 1875, p. 23.

Bromide of potassium is about the only drug on which we can rely for the mitigation of the symptoms, if not for the cure of the disease. It lessens the peculiar excitability of the nervous centres, and probably diminishes the amount of blood circulating in the brain, which may obviate the tendency to congestion, and so ward off the paroxysms when this condition is a factor in the complaint. As a sedative it controls the spasmodic character of the disorder, and, by promoting sleep, gives the brain rest. It is especially indicated if the epilepsy is traceable to masturbation, or to excitement of the sexual organs. Its action varies with different persons. In some, it not only lengthens the intervals of the seizures and renders them milder, but it cures the disease. The drug ought to be continued for months, or even for a year, after the epilepsy has ceased, the doses and the frequency of their repetition being varied from time to time according to circumstances. When omitted, in some cases, the attacks return with greater obstinacy than characterised the original seizures. In a few cases this remedy fails altogether. Dr Reynolds states that bromides appear less useful in growing girls and youths than in those who have reached adult age.*

The dose may be, to commence with, small, and increased gradually till the fits yield, or the interval is lengthened. A child at five years of age may begin with five grains three times a day, increasing the dose gradually to fifteen grains. It is important to be aware that large doses of this drug are borne by children without any bad results, unless continued over a very long period of time. From twenty to thirty grains for a dose have been given without any bad effects to children, eight or ten years of age. The bromide may be given in plain water with a little syrup, or in some bitter infusion. When the seizures take place during the night, a full dose of the bromide should be given just before bedtime. The bromide of sodium sometimes succeeds in arresting the convulsions when the potassium salt fails.

A boy six years of age, who was epileptic from birth, was relieved by the injection of fifteen grains of hydrate of chloral by the rectum, after the inhalation of chloroform and nitrate of amyl had failed. The fits occurred once a fortnight, and both in this case and in other cases related, the drug was sometimes given by the mouth and sometimes by the rectum. The fits were thus controlled in number and severity, the pulse became softer, the respiration free, and sleep was induced.[*]

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* Op. cit., p. 323.

Iron may sometimes be combined with bromide of potassium if there is great anæmia,[†] but though it may seem to be indicated, it does not agree well with epileptics. It may improve the general health, but it aggravates the epilepsy (Hughlings Jackson and Brown-Séquard). Iron given alone is of very questionable value, even when there is great anæmia. It must be combined with anti-spasmodics. Still, I think it should never be overlooked that very deteriorated blood cannot maintain the functions of the nervous system in a healthy state, and for this reason alone, a mild and soluble preparation of iron may be of service in some cases. The stronger preparations are too stimulating.

The rapid loss of blood may excite the epileptic state, just as animals die of convulsions who are bled to death. Ligature of the carotids in rabbits, as performed by Sir A. Cooper, produced convulsions, so that it seems necessary to maintain the cerebral circulation as near as possible at a normal standard. Anæmia and congestion of the brain are both excitants of the epileptic paroxysm, but blood may be very deficient in quantity and poor in quality without producing epilepsy; some other factor being needed to invite it.

Where there is a syphilitic taint, mercury or iodide of potassium will be necessary. Where there is dyspepsia or intestinal disturbance, and the urine contains oxalates, pale lithates or phosphates, nitro-muriatic acid should be given alone, or in combination with some bitter infusion.

Phosphorus is a good remedy where there is much nervous exhaustion.

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[*] "On the Therapeutic Value of Chloral Hydrate in Epileptic Convulsions" by J. A. Wallis, M.D., 'The West Riding Lunatic Asylum Med. Reports,' 1875, p. 257

[†] Form. 82:

℞ Ferri et Amm. Citr. gr. xvj
Potass. Bromid. ℈ij
Syrupi ʒiij
Aquam ad ʒiv.

M. A tablespoonful three times a day.
For children from six to twelve years of age.

Ergot is useful in ten to thirty-minim doses of the liquid extract, given three times a day. It lessens the hyperæmia of the cerebral vessels, and causes them to contract.

Dr Russell Reynolds speaks favorably of oxide of zinc. Given in three-grain doses twice a day after meals it has proved successful with some children. In one case under my care the drug caused a good deal of sexual excitement, disturbed sleep, frequent micturition, and a queer feeling in the hands and legs, which passed off when the remedy was discontinued. Bromide of zinc has been given successfully in epilepsy by M. Charcot, either in the form of pill or syrup.*

In regard to prophylactic measures an epileptic seizure may often be arrested by the application of a ligature between the aura and the brain, or by encircling the throat with a fold of linen rag dipped in hot water, which relaxes the cervical vessels, and also favours the removal of spasm from the vessels of the brain. A slight stimulant given to a child just before the seizure may possibly ward it off, as is the case with some adults.

Dr Ramskill observes that when the cerebral irritation is kept up by an excentric cause and such cause is removed, the application of ice to the sympathetic nerve (which issues from the last cervical and upper dorsal vertebra) and small doses of any of the bromides, will in many cases materially combat the irritation. The ice-bag may be worn in this situation for three hours night and morning. Its good effects are in proportion to the youth of the patient and the acuteness of the attack.†

I have known epileptiform seizures yield to thirty minims of tincture of hyoscyamus in camphor water three times a day after bromide of potassium had failed. Digitalis with bromide of potassium is sometimes useful.‡

When epilepsy is associated with cardiac disturbance, neurosal or organic, digitalis may be given with advantage, provided there is neither hypertrophy nor aortic regurgitation. We should, in fact, observe the same rules in prescribing it as in those cases of heart disease uncomplicated with epilepsy.

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* 'Brit.-Med. Journ.,' 1877, vol. ii, p. 752.

† "On Some Forms of Epilepsy," 'The Lancet,' 1881, vol. i, p. 730.

‡ Form. 83:

℞ Tinct. Digitalis, ♏xx—xl
Potass. Bromid. ℈j
Syr. Aurant. ℥ss
Aquam ad ℥iv
Fiat Mistura.

A tablespoonful three times a day.
For children from five to eight years of age.

Belladonna is sometimes of service when combined with bromide of potassium, and especially in cases of *petit mal*. Its action appears to be first stimulating and then depressing. Atropine is said by Gowers to be more efficacious than belladonna in some cases. A child, ten years of age, may take one minim of the Liquor Atropiæ in water twice a day.

CHAPTER XLIII

TETANY

SYNONYMS—*Tetanilla—Brachiotonus rheumaticus—Idiopathic muscular spasm—Fr., Tétanos intermittent—Ger., Schusterkrampf.*—SYMPTOMS—*Relation to ergotism—Association with rickets and laryngismus.*—DIAGNOSIS—*From epilepsy and tetanus.*—CAUSES—*Cold the most frequent—Diarrhœa—Worms—Nervous shock.*—PATHOLOGY.—PROGNOSIS.—TREATMENT—*Bromide of potassium—Hydrate of chloral—Chloroform inhalation—Castor-oil—Cod-liver oil—Iron—Cold water bandages—Galvanism.*

THIS peculiar and rare affection is functional in its character, and temporary in duration. It was first described by Steinheim in 1830, then by Dance in 1831.* He called it "intermittent tetanus"—a very good name, owing to the recurrence of the attacks. A few years later De la Berge† gave an account of two cases in a paper entitled "On Certain Muscular Retractions." The name of Tetany was bestowed on it by Corvisart in 1852. It would appear to be more common in France than it is in England. A few English writers have recorded cases since 1870.

Symptoms.—The attack is generally preceded by a creeping or dragging sensation, feelings of heat and cold, and pains in the forearm and hand, followed by contractions and stiffness in some of the fingers, which is the more noticeable when an attempt is made to grasp an object. The chief feature of the disease is the muscular spasm, marked especially in the hands. The cases vary much in severity; in some there is rigid contraction of the flexor muscles of the upper and lower limbs, the forearms being flexed on the arms, and the arms twisted behind the back; in others the arms are adducted, and the forearms crossed upon the abdomen; the hands are flexed at the wrists, the knees are bent, and the legs drawn up and rigid. This applies to severe cases, and not to mild ones, in which the arms and legs are relaxed and natural, the hands and feet being only involved. The position of the hands is the main feature of the disease. The fingers are drawn up into a cone and the thumb into the palm, but not flexed as is seen in ordinary convulsions. Trousseau says, "The hand assumes a conical shape, or better, the shape which the accoucheur gives to it when introducing it into the vagina."[*] The hands, fingers, and feet are the chief parts that exhibit the phenomena; the interossei and lumbricales muscles are extended and bent, or they may be so affected as to produce hollowness of the palm in the manner just alluded to.

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* 'Archives General.,' 1831.

† 'Journ. Hebd. des Sciences,' 1835, vol. iv.

The foot is arched, and the toes are flexed on the soles. The muscles of the calf and peronei may be rigid, and also those of the thorax and abdomen. In slight cases the foot may be unaffected. Great pain sometimes accompanies the contraction, and there is swelling of the hands and feet in some cases, which may be red and shining. The œdema has been referred to blood-stasis from compression of the veins by the tonic contraction of the muscles. Opisthotonos and trismus have been noticed in severe cases, but this is very rare.

Dr Moxon has described an interesting case of "Tetany" or Remittent Tetanus in a little rickety boy who was very backward and unable to talk. The attack commenced at five months old, with difficulty in breathing, the backs of the hands swelled, and the hands and feet were cramped. The first thing noticed was a turning in of one thumb across the palm, and the backs of the hands were turned forwards by extreme pronation of the forearm. In the fourth attack the child was suddenly seized with contraction of the hands, and he was so stiff the mother could not bend him. The hands were also swollen, and any attempt to overcome the action of the flexors, and the contracted state of the fingers, caused great pain. The feet were similarly affected.[†] The case was treated successfully with cod-liver oil, bromide of potassium, and steel wine.

The symptoms of ergotism and tetany are similar as observed by Bauer and Moxon. Kussmaul showed that there is a relationship between tetany and the amount of blood traversing the arteries.[‡]

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[*] 'Clin. Med.,' New Syd. Soc., 1867, vol. i, p. 375.

[†] 'Guy's Hospital Reports,' vol. xv, p. 278.

[‡] 'Brit. and Foreign Med.-Chir. Review,' vol. ix, p. 30.

Of fourteen cases collected by Dr Abercrombie, nine were boys, their ages varying from nine months to two and a half years. In seven cases there had been previous attacks; in five cases the complaint was ushered in with convulsions, and in seven others it was more or less sudden.[*]

The muscular rigidity continues during sleep, which has been argued in favour of a spinal and not a cerebral origin. Laryngismus is a constant symptom and the disease is associated with patency of the anterior fontanelles, sweating of the head, beading of the ribs, and delayed dentition as in rickets. The spasm is variable in duration. It may last a few minutes to a few hours, and then the rigidity of the muscles subsides and only a feeling of fatigue remains. "Days, or even weeks, may intervene between two attacks, but, as a rule, they succeed each other after an interval of a few hours, recurring several times in the course of the day. It is only in very severe cases they follow one another so rapidly that the patient remains but a few minutes free from spasm."[†] When the attack is severe it is accompanied by elevation of temperature, and hence it may be mistaken for spinal meningitis, acute rheumatism, or tetanus.[‡] Frequent pulse, loss of appetite and coated tongue are common. The disease is prone to relapse. It is not generally fatal, but it may destroy life if the muscular contraction attacks the mechanism of respiration.

Diagnosis.—The disease may be distinguished from epilepsy, by there being no loss of consciousness; from tetanus, by the intermission of the attacks, and the spasms beginning in the upper and lower extremities, and not in the jaws. Dr Wilks observes that the disease may be mistaken for convulsions, but the recurrence of the symptoms and the tonic spasms show that it is a peculiar one. In some cases the whole body may be affected as in tetanus, in others the limbs may be alone involved.[§]

Causes.—Great uncertainty prevails as to the causes of tetany. It does not seem to be associated with any distinct organic change. There is a strong tendency to the disease from the fourth to the sixth year. Cold is considered to be the most common of exciting causes, and the swelling of the joints, which occurs in many instances, indicates that it has a close relation to true rheumatism.

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[*] 'On Tetany in Young Children,' 1880, p. 14.

[†] Ziemssen, 'Cyclopædia of Medicine,' vol xi, p. 370.

[‡] Buzzard, op. cit., 1882, p. 411.

[§] 'Brit. Med. Journ.,' 1870, vol. i, p. 598.

Diarrhœa and all forms of intestinal disease, worms, &c., are very effective in inducing tetany.* The subjects of this complaint often come of nervous parentage, and if one child of a family has it, the rest will be likely to suffer. An epidemic of tetany is mentioned as having occurred at Gentilly in 1876. There were in all eleven cases. M. Simon considered that four of the cases were due to spinal congestion arising from cold, and the others to involuntary irritation from nervous shock.†

Pathology.—There is much difference of opinion on this point. Trousseau considers the disorder to be of rheumatic origin,‡ whilst others are of opinion that the morbid action is allied to chorea, tetanus, and catalepsy. The condition has been attributed by some to extreme reflex excitability of the spinal cord. Dr Hughlings Jackson suggests that the phenomena may be explained in consequence of an antagonism between the two great centres of the cerebrum and cerebellum.

Prognosis.—This is generally favorable, the complaint under judicious management subsiding after a few months.

Treatment.—The patient should be kept very quiet, and the affected limbs at rest. Seeing the association of the disease with laryngismus and rickets, bromides and hydrate of chloral may be useful. Chloroform inhalations have proved serviceable in relaxing the contracted and painful muscles. A dose of castor oil, or some other mild aperient, will be necessary now and then to remove irritant matter from the bowels. In Dr Wilks' case cold water bandages applied round the limbs afforded ease, and the child became immediately tranquillised.§ According to Trousseau compression of the vessels of the affected limb will arrest the paroxysm, and placing the limb in cold water will modify the contraction in many cases. The galvanic current has permanently cured the spasms in some instances.‖ When the acute symptoms have subsided, the chief aim should be to improve the general health, and for this purpose cod-liver oil and soluble preparations of iron are generally indicated.

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* Ziemssen, op. cit., p. 368.

† 'Progrès Méd.,' 1876, p. 833.

‡ 'Clinique Med. Trans.,' vol. ii.

§ 'Brit. Med. Journ.,' 1870, vol. i, p. 598.

‖ Ziemssen, op. cit., p. 377.

CHAPTER XLIV

INFANTILE CONVULSIONS OR ECLAMPSIA

General and Partial.—Symptoms—*Subject to much variation—Sometimes preceded by heat of head and febrile disturbance—State of the pupils—Carpo-pedal contractions.—Salaam convulsions.*—Causes—*Predisposing and exciting—Nervous susceptibility and family inheritance—Rickety constitution and delayed dentition—Indigestion—Diarrhœa and improper food—Heat and cold—Foreign bodies in the brain or other organs—The eruptive fevers, especially scarlet fever—Renal disease—Relation to laryngismus.*—Terminations—*In asphyxia—Shock and syncope.—Hemiplegia.*—Pathology and Morbid Anatomy—*Congestion of brain and membranes.*—Treatment—*Removal of cause if possible—Aperient medicines or enema—Warm bath—Chloroform inhalation—Bromide of potassium—Hydrate of chloral—Tonics and sedatives after the fits.*

Night terrors—Mental disorder—Melancholia—Nervous and hysterical symptoms—Headache—Cretinism—Idiocy—Backwardness—Imbecility.

The brain is said to undergo such rapid development during the first few years of life, that by the completion of the second year, when the first dentition is over, its size is doubled; and by the seventh year it has nearly attained its maximum bulk, though its growth, according to Solly, is not completed till the twentieth year. An organ growing so rapidly, and receiving one fifth of the whole mass of blood circulating through the body, when every other organ is in process of active development, must be liable to resent excitement of any kind and to take on morbid action. The bones of the cranium are thin in early life, the brain substance is elastic, and the cerebral vessels do not derive from it the same degree of support as do those of the adult, and therefore, cardiac excitement, violent coughing, or the sthenic action consequent on inflammatory fevers, subjects the cerebral vessels to over-fulness. The development of the brain is so great, that whilst on an average in man its entire weight constitutes 1 in 36 to the rest of the body, in the average of mammalia it is only 1 to 186.* When it is considered that the arterial anastomoses are so free, it is evident that any obstruction to the supply of blood through the chief vessels of the brain or their branches, may exert such an influence on the nervous matter as to suspend or derange its functions.

In consequence, then, of this highly-developed state of the nervous system, convulsions are amongst the most frequent and dangerous diseases which attack the nervous system in infant life. The mortality resulting from them ranks before that of the great majority of other diseases, including atrophy, the specific eruptive fevers, pulmonary disorders, and affections of the larynx and trachea. Up to the age of five years the mortality is enormous; but after the age of nine it is considerably diminished. In infancy males are more subject to the disease than females.

The form and degree of convulsions vary greatly. The whole body, or the half of it, the head and neck, or the muscles of one limb may be affected from the slightest tremor to the most rigid contraction.

Convulsions in infants and young children consist in spasmodic contraction and relaxation (independent of the will) of the voluntary muscles, accompanied by unconsciousness. The seizures are owing to a morbid excitability of the reflex centres of the pons Varolii and medulla oblongata. In many respects they resemble epilepsy, from which indeed they cannot be invariably distinguished. The fit is almost precisely the same, but it is of shorter duration in convulsions. Trousseau defines idiopathic epilepsy as only recurring eclampsia, and eclampsia is merely accidental or transitory epilepsy. Convulsions constitute in reality a wide term, since they occur in various conditions when the lesions are entirely different—as, for instance, in epilepsy, tetanus, chorea, and meningitis. They may happen to delicate infants when the supply of blood to the brain is deficient.

Symptoms.—The attack occurs either suddenly, or is preceded by undue excitability of the nervous system. The infant is sometimes feverish for a day or so before the seizure, the head is hot, the appetite is gone, and there is thirst. It is restless and starts in its sleep, or wakes up frightened; the eyes are heavy and have a peculiar rolling motion and the respiration is irregular. In some cases the child is in its usual health when it is suddenly seized; in others the attack comes on during some eruptive disease, or during dentition.

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* 'Carpenter's Human Physiology,' 8th edit., p. 787.

On the approach of the attack, the child utters a scream and looks vacant; the eye is tremulous and the eyeball is turned upwards, inwards, or downwards, so as in some cases to hide the iris entirely. The pupils may be contracted or dilated, or one may be contracted and the other dilated; but there is no uniformity in this respect. Inspiration is loud and snoring in some cases, and twitching of the lips and starting in sleep are among the symptoms. The facial muscles are also involved in the paroxysm, and the countenance becomes terribly distorted and hideous; there is frothing at the mouth and closure of the jaws, whilst the head is thrown backwards or to one side. The cervical and dorsal muscles are rigid, and the whole body is stiff; the thumbs are turned inwards, the toes flexed as in tetany, and the sole of the foot is arched.*

One peculiar form of convulsions in children is that known as eclampsia nutans or salaam convulsions, because it resembles the obeisance of an Oriental before his superior. It consists of a bending of the head and body forwards with great rapidity for a certain period, when it ceases. During this time the child seems bewildered, but as soon as the convulsions cease the intellect becomes clear. While they are present the mental and bodily health seems impaired, but no permanent effect in either has been observed. They are not associated with any known changes in the nervous system; they may, however, in certain cases, be the precursor of epilepsy, especially if they are persistent.

Causes.—These may be *predisposing* and *exciting*. Among the former is a nervous susceptibility inherited from the parents. This may not, however, have actually manifested itself in the form of convulsions, but there is, perhaps, a neurosal diathesis on one or both sides, and on inquiry it will usually be found that in other members of the family there is a history of convulsions or chorea in childhood, and of neuralgia, asthma, insanity, or other disturbance of the nervous system in adult life. The children of mothers who have had convulsions themselves in infancy are stated by Trousseau to be liable to a similar affection. He quotes a remarkable case by Dr Duclos, of Tours. "A woman, 34 years of age, the sister of ten children, six of whom died of convulsions, and who herself had had frequent attacks of eclampsia up to the age of seven; these had left behind slight deviation of the mouth and ptosis of the left upper eyelid. This woman had ten children who all had convulsions; six had died, five in the first two years, and one when three years old. Her youngest, whom she brought to me at the Necker Hospital, was a little girl, six months old; three months previously she had had a first attack, which had lasted about ten minutes, and which her mother ascribed to her having given the breast to the child immediately after a fit of passion, as the convulsions occurred on the ensuing day. Death took place three months afterwards from cerebro-meningitis."[*] Trousseau also mentions the case of a child who had eclampsia from the nurse going into a fit of passion a moment before giving him the breast.[†]

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* See Chap. XLIII, "On Tetany," p. 587.

Convulsions are frequent in rickety children.[‡] A rickety child, eighteen months old, came under my care in 1876; she had only three teeth. As many as six fits took place in the twenty-four hours, each fit lasting about a minute. The face was drawn to the right side and much distorted; the pupils were dilated. At the termination of each fit the child became conscious, but fell asleep afterwards. Sleep and coma are, however, more common after epilepsy.

Exciting causes.—Dentition has generally been considered the chief cause of infantile convulsions, but recent observations do not corroborate this view. It is more in consonance with facts to say that the excitability of the nervous centres is excessive during the first year of life, and that slight causes, during the period of the first dentition and weaning, are liable to give rise to convulsive seizures.

When severe eruptions of the scalp in children are dried up too quickly, convulsions sometimes follow. I have seen a few cases. A child, ten months old, came under my care in 1875, with eczema of the entire head, the whole scalp being covered with crusts, from beneath which an irritating discharge escaped. When the healing process was nearly completed, and the discharge had ceased, the child had a succession of convulsions, which terminated fatally in three days.

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[*] 'Clin. Med.,' 1867, vol. i, p. 343.

[†] Ibid., p. 345.

[‡] Of 61 eclamptic children, 56 were rickety (Dr. Gee, 'St. Bart. Hosp. Reports,' vol. iii).

Convulsions may be met with in infants at the breast who suffer from vomiting and diarrhœa. The fits subside when the functions of digestion are set in order. Improper and insufficient food, by lowering the nutritive functions, will exhaust the strength, and by depriving the nervous system of its proper support, render it more unstable. Diseases of the intestinal canal, and especially worms in the bowels, are common causes. Hot weather may so lower and exhaust the system as to bring on convulsions. Cold, by paralysing the vaso-motor system, may equally provoke an attack, and exposure to night air is particularly dangerous in this respect. Laryngismus, mental emotion, as fright, terror, &c., are exciting causes, and children brought up by hand are liable.

Convulsions may occur during the eruptive fevers and acute pulmonary affections. One of the worst cases I have ever seen was that of a little girl, nine years of age, who was fearfully nervous at all times, and came of highly neurotic parents. The seizure happened when the whole body was covered with an eruption of measles. One of the fits lasted an hour and three quarters, and the child threatened to die of asphyxia, but rallied and was carried off by another fit on the following day. In these cases the febrile disturbance induces hyperæmia of the brain and membranes, the vessels carrying too much blood to the head, and that at an elevated temperature, as may be witnessed in some cases of meningitis. When convulsions occur in association with whooping-cough, organic disease of the heart, and intestinal torpor, the cerebral vessels are probably in a state of hyperæmia. Cerebral anæmia, from loss of blood and deficient vital power, may equally bring on these fits.

Convulsions may arise when the urine is albuminous from desquamative nephritis as in scarlet fever, or in measles and smallpox where the blood is poisoned, and the renal organs cannot eliminate their morbid products.

Convulsions are stated by Trousseau and others to have been set up by a pin or needle, or a fragment of the inner table of the skull, sticking into the membranes of the brain, or even into other internal organs.

Blisters, burns and scalds are also among the causes.

Terminations.—Death is usual in infants when the seizures are grave, but older children frequently survive. It may be due to asphyxia from the violence of the seizure, or from shock and syncope. Much, however, will depend upon the cause and nature of the fits. When they arise in the course of an eruptive disease, as whooping-cough, they are less serious than when the fits are due to congestion of the brain, or the opposite condition from exhaustion. The fits that occur during the desquamative stage of scarlet fever, when the urine is albuminous, are attended with great danger to life, and more especially if there be anasarca. When the attacks do not prove fatal and are severe, or repeated frequently, they may produce mental weakness, stupidity, stammering, strabismus, idiocy, stunted growth, or even epilepsy.

Hemiplegia may be the result of convulsions, and as in one case which came under my care some years ago, the brain was never strong afterwards. When the convulsions recur frequently, such a degree of congestion or extravasation may take place as to produce a paralytic affection of one arm or leg. Dr West observes that the prognosis is exceedingly bad, if the convulsions recur rapidly, and that this is worse in children of three or four years of age than in infants, as it indicates greater disturbance and one less likely to pass away. He goes on to say that those cases are less hopeless, where five or ten or more fits take place daily, for days or weeks together. Such cases seldom happen after dentition is completed. The danger of these attacks, says Dr West, seems to lessen with the frequency of recurrence though they may end by becoming habitual, and further, that there is a relation between convulsions in early infancy, and epilepsy in subsequent childhood.*

Morbid anatomy.—After death dissection discloses congestion of the brain and membranes, effusion into the ventricles or sac of the arachnoid, and hæmorrhagic points may sometimes be noticed on section of the hemispheres; congestion of the spinal cord is also present. These morbid changes are the consequences of the convulsions; just as in epilepsy, they are not the cause, but the result of the malady. Anatomical lesions cannot, however, be invariably discovered on the most careful dissection, and when they are found they appear to be rather a consequence than a cause of the seizure. It should not be forgotten that convulsions are not incompatible with an anæmic state of the brain.

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* 'Diseases of Infancy and Childhood,' 1859, p. 194.

Treatment.—This does not materially differ from that of epilepsy and some other allied disorders, but convulsions cannot be dealt with alike in all cases. The first step is to ascertain, if possible, the cause before aiming at removal. In the seizure the child should be surrounded by pure air, and any clothes that interfere with the circulation should be at once removed. If it cannot swallow, an enema should be administered, so as to clear the bowels of any source of irritation that may be lurking in them. A mustard poultice may also be applied to the extremities. Placing the child at once in a warm bath, so as to excite the cutaneous circulation and relieve internal congestion, is a common and useful practice, whilst cold water is poured over the head and face at the same time. For the treatment of recurring convulsions the late Sir James Simpson strongly advocated the use of chloroform inhalations. Dr Wilks also speaks favorably of the practice. "In those cases where the whole body is constantly distorted to the great distress of the mother, chloroform will cause the movements instantly to cease, and sometimes with their arrest the child may fall into an apparent sleep. I have given it in many cases with the greatest advantage and relief."* It is not necessary to keep the child deeply anæsthetised, but to administer it when each fit is threatening. When the paroxysm has subsided, the gums should be lanced if tense; and if the pulse is good and there is sthenic excitement, a grain of calomel on the back of the tongue may be needed, so as to rouse the liver and small intestines to freer action. In the cases of strong and robust children, where the signs of active hyperæmia are present, one or two leeches may be applied behind the ear or on the temple.

To ward off a recurrence of the fits in the intervals, bromide of potassium or ammonium will be necessary to calm the nervous centres, and it may be well sometimes to combine with it a few grains of hydrate of chloral if there is sleeplessness. Children bear hydrate of chloral well. If a sufficient dose be given to induce sound sleep, the convulsions cease, and there is often no return when the child wakes. If the child cannot swallow, Dr Ringer recommends five grains to be thrown into the rectum, which soon cause a deep sleep, and the convulsions then cease, at least, temporarily.[*]

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* 'Diseases of the Nervous System,' 1878, p. 140.

Opiates are sometimes useful and preferable to the remedies just mentioned. The younger the child the greater the caution necessary in their exhibition.

When the convulsions depend upon toxæmic causes, as from the scarlatinal poison, the bowels must be kept freely open, and elimination encouraged. Above all, nitrogenous food should not be indulged in where uræmia is dreaded. If there are worms in the bowels such remedies as aid their expulsion must be had recourse to.

After the cessation of the fits, cod-liver oil, and some preparation of iron, as the syrup of the hypophosphite, may be needed; whilst a sedative should be given at bedtime to calm the nervous system and to promote sleep.

Night terrors.—A child who suffers from this affection generally goes to bed quite well, and after falling soundly asleep, wakes up in great alarm in the course of an hour or two, screaming in the most terrified manner. The child fails to recognise the nurse, and refuses to be appeased. It has probably been dreaming that a cat is on the bed, or that it is pursued by a savage dog or other animal, from which it cannot escape. After a time, the nurse or parents succeed in pacifying the child by petting it, and carrying it up and down the room. Then it falls off to sleep tranquilly, and wakes up as well as usual. Sometimes there is no recollection whatever in the morning of what had occurred during the paroxysm of terror. It is consolatory to parents to be assured of the harmlessness of these attacks.

Causes.—These are chiefly indigestion and constipation, but diarrhœa and dentition are also capable of exciting an attack. Worms, injudicious feeding, and hereditary syphilis may provoke it. Dr West relates the case of a boy who had "night terrors" for a year before cutting his first molar teeth.[†] Some seizures would appear to be of an epileptic nature,[‡] and others are allied to hysteria.[§] It seems certain that weakly, excitable and nervous children are most prone to suffer. These terrors are sometimes traceable to the cruelty of nurses, who frighten children, and create a fear of being in the dark. Overwork at school is another cause, of which the following appears to be an example :—A boy, twelve years of age, of anxious and nervous temperament, was brought to me in 1879, who, four years previously, was seized with somnambulism and "night terrors;" after being asleep for three quarters of an hour he would wake up and get out of bed, then walk out of the room, and if at all interfered with would shriek and become very violent; when his father and mother came into the room he knew them, but seemed terror-stricken, and asked for their protection. The attacks were attended with cold hands and feet, clammy skin, and a thumping action of the heart. When away from home he never had any seizure. A year before I saw him he had several attacks whilst his examination at school was going on, and there was some evidence to show that his brain had become irritable and exhausted. The urine contained phosphates; the motions were large and costive; the abdomen was full and hard.

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[*] 'Handbook of Therapeutics,' 8th edit., p. 371.

[†] 'Diseases of Infancy and Childhood,' 1859, p. 239.

[‡] See Chap. XLII, p. 569, "On Epilepsy."

[§] Handfield Jones, op. cit., p. 452.

Diagnosis.—These nocturnal seizures make friends anxious, fearing that some cerebral affection may be impending, but if the attacks recur from time to time, yet each morning finds the child free from headache, and there is no intolerance of light or sound, no drowsiness or stupor, and, moreover, the pulse is quiet and regular, and the belly hard and of normal shape, then we are correct in attributing the symptoms to sympathetic disturbance in the abdominal organs.

Treatment.—In the management of this peculiar state, the digestive functions should be carefully regulated, and all sources of irritation removed from the intestinal canal, by mild aperients of soda, rhubarb and taraxacum (Form. 19—26), after which, bromide of potassium, to allay nervous excitement, will be required. The room should have a light in it, and the nurse or the mother be near when the child awakes frightened. Mental discipline is most important. The child requires to be treated with kindness, yet firmness, and if old enough, reasoned with on the nature of his ailment. He should be taught not to give way to every impulse, or to become petulant on slight provocation.

Mental disorder is much less frequent in children than it is in adults, still instances now and then occur, and the practitioner ought to be acquainted with the symptoms and the forms it may assume. Cases are recorded in which acute mania was set up by the exanthemata, typhoid fever, and cerebral tumours.

Melancholia is a state of mental depression occasionally met with in delicate children whose education has been defective, and whose parents are morbid or hereditarily nervous. Steiner mentions the case of a boy, six years of age, whose only playmate, his sister, died of tubercular meningitis. He grew melancholy, lost his appetite and sleep, and was tormented with the idea that he must die soon. This sad condition lasted two years, when he recovered.* In the adult, cases of mental shock are recorded, the death of one sister being soon followed by that of the other; and the death of one twin adult so affected the other that he has succumbed to the same disease in a few weeks.†

Nervous and hysterical symptoms in boys sometimes occur, just as they do in girls and young women, owing to some unhealthy condition of the nervous system. Dr Wilks relates the case of a boy who said he was paralysed, and that he could neither see nor hear. When it was proposed to apply a red-hot iron up and down his spine, he got up and escaped at the door.‡ A morbid excitability of the nervous system shows itself in attacks like croup, anorexia, hyperæsthesia, nervous dyspnœa and the like.

Headache is of frequent occurrence, and the younger the child the more importance should be attached to it.

The chief varieties of headache in children are:

1. *Cerebral headache* arising from injury, or from chronic inflammation.
2. *Gastric headache* due to intestinal and hepatic disorder, known as bilious or sympathetic headache.
3. *Congestive headache* as observed in epilepsy, and obstructive disease of the heart.
4. *Febrile headache* due to active hyperæmia, or active congestion.
5. *Headache from anæmia, neuralgia, &c.* (nervous headache).
6. *Organic headache*, arising from cysts in the brain, tubercular and other morbid growths.

Cerebral headache.—Here the functions of the brain are temporarily interrupted, and the circulation is disturbed. Some transient giddiness or nausea is felt at the time, and the matter is no more thought of till the brain is excited, and then its weakness is revealed. The pain is usually frontal; the child is dull and languid, and if no notice is taken of such a case, and rest and proper remedies are not employed, the symptoms may result in meningitis.

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* 'Diseases of Children,' by Lawson Tait, 1874, p. 57.

† 'Diseases of the Nervous System,' by S. Wilks, M.D., 1878, p. 398.

‡ Op. cit., p. 385.

Gastric headache.—In these cases the tongue is foul, the stomach secretes unhealthy mucus, and the starchy principles of the food undergo fermentation.

Congestive headache in its active form is attended with drowsiness and disturbed sleep and dreams; the head is hot, and the temporal arteries throb. The pain is chiefly frontal. In the passive form the circulation is more sluggish, and favours a blood stasis in the vessels of the brain. This form of headache is sometimes very severe after epileptic seizures, in whooping-cough, and in heart disease where there is an impediment to the circulation, and the brain is overloaded with blood.

Febrile headache.—Here the circulation is excited and a larger quantity of blood is conveyed to the brain than in health. In the continued fevers the headache is sometimes intense, and in the exanthemata before the eruption has appeared.

Headache due to anæmia and neuralgia (nervous headache). Neuralgic headache is not of frequent occurrence in children. It sometimes arises from long and exhausting illness, indoor confinement, overstudy, deficient food, anæmia, dental caries, &c.

Organic headache.—The symptoms are severe headache, continuous or paroxysmal, followed by convulsions or coma.

When headache is frontal it is generally described as a heavy, continuous and dull pain. The child can scarcely raise his head, and there is loss of appetite, nausea, and vomiting. Frontal headache is often due to hypermetropia from overtaxing the eyes in reading, and it is especially common in children who inhabit overcrowded rooms, and exert their brains at the same time.

Treatment.—This will depend upon the variety of headache. If the cause admits of removal, as stomach derangement and worms in the intestines, suitable remedies must be selected. When the headache is the consequence of disordered vision as in hypermetropia, where the eyes are constantly strained, an oculist should be consulted, and when properly adapted glasses are worn, the headache will depart. In some forms of congestive headache where the pain is dull and oppressive, three or four leeches may be applied to the temples, and a saline aperient given twice or three times a week. At the same time the diet requires to be carefully regulated and the mind rested. The headache of neuralgia and anæmia demands such remedies as iron and arsenic, which require to be continued for some weeks. The bromide of potassium and ammonium with small doses of strychnia are serviceable in nervous headache. The pain of organic headache is sometimes relieved by the hypodermic injection of morphia, but it requires to be used with caution.

Cretinism is a very peculiar disease allied to idiocy. It is an epidemic which prevails in Alpine districts, more especially among the inhabitants of some parts of Switzerland, the Pyrenees, and the Tyrol. But it is met with in all quarters of the globe, in the Himalayas, Chinese Tartary, Madagascar, the Rocky Mountains of North America, and in a small proportion of cases in Derbyshire, Somersetshire, and some parts of Yorkshire. "It is, however, most common in shut-up valleys, and has a close connection with goitre. Nowhere does cretinism occur where goitre is absent, but goitre may occur where cretinism is unknown or rare."* It is usually congenital. Cretins appear to escape the ordinary ailments of childhood, but they are liable to diseases of the nervous system, as convulsions, hydrocephalus, asthma and apoplexy. Rickets ending in lameness is a frequent complication.† The cretin is so debased, and his habits are so low and disgusting, that he is hardly raised above the animals that surround him. He is obstinate, malicious, and sensual. Cretinism is a species of idiocy, accompanied by small stature, mostly under four feet, large and square head, vacancy, and want of expression. The sufferer from this disease is sometimes blind or deaf and dumb. Life may extend to old age. Dr Güggenbuhl, in 1841, established a hospital in the Canton of Berne, for the purpose of educating these poor creatures; and the experiment was attended with some considerable success.

Idiocy.—An idiot may be defined as a person of unsound mind, whose moral and intellectual faculties are more or less destroyed, or have never been perfectly developed. Dr Ireland defines it as mental deficiency or extreme stupidity, depending upon malnutrition, or disease of the nervous centres, occurring before birth, or the evolution of the mental faculties in childhood.‡ Some idiots can scarcely speak, whilst others articulate a few words, and to some extent are capable of improvement. They are not able to acquire knowledge; the mind remains childish, and the countenance is void of expression and intelligence, the forehead is low, the mouth open, the ears are large, the lips thick and everted, and the teeth decayed. There is deafness and imperfect articulation, whilst the hands are used awkwardly. The functions of organic and animal life are more or less impaired, nutrition is imperfect, and the motions are frequently passed involuntarily.

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* 'Idiocy and Imbecility,' by Dr Ireland, 1877, p. 174.
† Ibid., p. 192.
‡ Ibid., p. 1.

The expression of the countenance is usually good-natured and confiding. As a rule the body as well as the mind is dwarfed, and idiots are shorter and lighter in weight than normal children. They have not, necessarily, large heads, though striking abnormalities in size and form are met with. Dr Shuttleworth states that the general head circumference averages 20·5 and 19·9 inches, for male and female idiots respectively, as against 20·87 and 20·33, for male and female children of normal intelligence.[*]

Causes.—Idiocy may show itself soon after birth, as a consequence of organic diseases of the brain. It is frequently seen in the families of those in whom the neurosal tendency has been manifest by such diseases as epilepsy, insanity, and imbecility. It may be associated with rickets, goitre, and stunted growth. In 28 per cent. of 800 cases there was a history of infantile convulsions, and in 20 per cent. these convulsions were assigned as the cause of the idiocy.[†] Of 2000 cases, 45 per cent. presented well-marked neuroses in one or both parents.[‡]

Idiocy has also been traced to forceps delivery, falls on the head in birth, fright, and other shocks to the nervous system.

"Out of 420 cases of congenital idiocy examined, some information was obtained respecting the condition of the progenitors of 359. Now, in all these 359 cases, *save only four*, it is found that one or the other, or both, of the immediate progenitors of the unfortunate sufferers had, in some way, widely departed from the normal condition of health, or violated the natural laws, that is to say, one or the other or both of them were very unhealthy or scrofulous, or they were hereditarily predisposed to affections of the brain, causing insanity; or they had intermarried with blood relatives, or they had been intemperate, or had been guilty of sexual excesses which impaired their constitutions."[§]

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[*] "The Physical Features of Idiocy," 'Liverpool Medico-Chir. Journal,' July, 1883, p. 286.

[†] Op. cit., p. 298.

[‡] 'Brit. Med. Journ.,' Oct. 11th, 1873.

[§] 'Report of Commissioners of Massachusetts on the Causes of Idiocy,' 1848, p. 8.

Backwardness.—There are some defective children who cannot be truly denominated idiots. They are slow to learn. "Backward" is the termed used here, "*enfans arrières*" as the French term it; they cannot keep pace with other children at school, at least when small. Some of them, however, brighten up considerably when the pubertal changes are completed, and in ordinary matters can take their part in life fairly well, but they are incapable of any great mental effort. Others are not so fortunate, and continue conspicuously defective throughout the whole of life. Where the parents possess sufficient means, it is well to place these children under skilled supervision, as the training to which they are subjected is of the most vital importance to them.

Imbecility is a term used to denote a minor degree of mental deficiency than idiocy (Bucknill and Tuke). Some imbeciles know those about them; they are affectionate, and are capable of taking care of themselves, but passionate and inclined to theft. Others are shrewd and witty, and cause much amusement. There are those again who are dangerous to society, liable to commit acts of murder or incendiarism.

"At a very early age the functions of the brain—at least in regard to its intellectual operations—appear to have stopped; hence we see a school full of grown-up boys and girls, sometimes of the age of eighteen or twenty, no more capable of taking care of themselves than children of three or four. They cannot use their hands in any ordinary operation; sometimes they do not know the way to eat with a knife and fork, and as a rule, the new-comers are utterly incapable of dressing or undressing themselves. Their very actions are those of little children; their motions and fears, their joys and sorrows, remind us most forcibly of those we witness in a nursery of little ones."*

Treatment of idiocy and imbecility.—A great deal can be done for these unfortunate children in the way of education. Institutions like Earlswood and Normansfield in this country, and many in the United States, fully prove that the treatment pursued there has been attended with the best results. The aim should be to put the bodily health into the best possible state, and then, by a specially moral and judicious course of teaching, to improve the mental condition.

Parents in the upper walks of life are frequently disinclined to part with children thus afflicted, but it will be well to strongly advise the placing of such cases under proper training, as it is impossible to obtain for them at home the same beneficial influences. Moreover, it will always be of great importance to isolate an idiotic child from the other children of a family, as the healthy will ordinarily tease and tyrannize over the weak, whilst the contact with imbecility cannot be otherwise than detrimental to the more fully developed minds.

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* 'Borderlands of Insanity,' by Andrew Wynter, M.D., 1875, p. 167.

CHAPTER XLIV (*continued*)

CONGESTION OF THE BRAIN

VARIETIES OF.—1. *Active or arterial*—2. *Passive or venous*—*Congestion of the membranes*—*Hyperæmia of the grey matter.*—CAUSES—*Heart disease*—*Vitiated states of the blood*—*Dentition*—*Injuries of the head*—*Violent fits of coughing*—*Prolonged vomiting.*—SYMPTOMS—*Febrile disturbance*—*Heat of head*—*Quick pulse*—*Headache*—*Constipation*—*Sickness*—*Restless sleep*—*Hallucinations or delusions in some cases.*—TREATMENT—*Venæsection or leeching*—*Purgatives*—*Starvation*—*Cold applications to the head*—*Action of aconite*—*Bromide of potassium*—*Hydrate of chloral.*—APOPLEXY OR CEREBRAL HÆMORRHAGE—*Causes*—*Symptoms*—*Treatment.*

THIS may be active or arterial, passive or venous; active congestion being that in which an actually larger quantity of blood is supplied to the brain and its membranes, and passive congestion existing where there is no increase in the supply, but an impediment to the return of the blood from the brain and its membranes to the right side of the heart. It occurs in so many diseases both of functional and organic origin, that it must be viewed more as a symptom than anything else. Still, I believe it to be an independent affection, an uncomplicated condition, which does occur now and then in infants and young children.

The amount of cerebral congestion varies a good deal in different cases. The membranes of the brain are almost always congested at the same time, as the same causes act upon both parts. There is a simple post-mortem hyperæmia, which occurs from gravitation of the blood to the lowest level, and is seen after death from febrile diseases where the blood remains unusually fluid. Post-mortem examination shows the vessels of the brain to be full and enormously congested in some cases, where this has not been suspected during life. There may have been no stupor, no headache, no convulsions—no symptoms, in fact, to call attention to this morbid state.

The grey matter appears dark red or violet, and where the hyperæmia has been severe, as in infants soon after birth, the white matter may appear almost as dark as the grey. On cutting through the brain substance, drops of blood are seen to ooze in profusion from numerous small points, which are the mouths of open blood-vessels. There may have been no stupor, no headache, no symptoms, in fact, to call attention to this morbid state.

Causes.—Active congestion may occur in hypertrophy of the left ventricle, in connection with valvular disease, which is seen in children after rheumatic fever. Whatever excites the circulation propels more blood to the brain, and overfills the vessels and sinuses. If it be vitiated by the absorption of the scarlatinal or smallpox poison, we have a most efficient cause of congestion. How far, again, may not cerebral congestion be a consequence of the convulsive paroxysm rather than a cause, due in part to some disturbance of the nervous system, which deranges the cerebral circulation? A child, three years of age, who was in good health, was taken out in extremely cold weather, and when brought home was drowsy, and the extremities were cold. It soon relapsed into an unconscious state and died, death being preceded by a convulsion. No post-mortem examination could be obtained, but the cerebral symptoms were in all probability due in great measure to congestion of the brain and its membranes. This pathological state, too, probably exists in the preliminary stage of many diseases, as smallpox and scarlet fever. Congestion of the brain occurs during the disturbance caused by dentition, injuries of the head, or exposure to heat, and also in consequence of violent fits of coughing, as in whooping-cough, and from severe or prolonged vomiting.

Symptoms.—There is febrile disturbance, heat of head, quick pulse, and disinclination to encounter the light. If the child is old enough, it complains of pain in the head, and is fretful and irritable, any noise or excitement in the room aggravating the symptoms. Sleep is disturbed by sudden starts and muscular twitchings. The bowels are generally constipated, and sickness and headache often precede the outbreak for some days. Such symptoms as these are common enough during dentition, and under careful diet and suitable medicines they pass off; but when they are present we are never certain what the issue may be; not infrequently a fit of convulsions ensues, consequent on the cerebral congestion. On the other hand the case may drag on, and the child, though recovering from the more acute symptoms, becomes listless and torpid; it ceases to have an interest in persons and things; it often vomits its food, and the pulse is habitually quickened. We apprehend the supervention of meningitis, though the temperature may be scarcely, if at all, elevated till a later stage.* The case continues, and either a convulsion or drowsiness, succeeded by heavy restless sleep and comatose symptoms, precedes death.

In 1863 and 1864, I had under my care two children of the same family, aged respectively two and three years. After being taken out in very cold weather they were seized with symptoms of cerebral congestion, followed by drowsiness and collapse, with coldness of the extremities. The symptoms were alarming for a time, but a warm bath and a stimulant in both cases brought about recovery. The children were both well till the exposure, and they have since grown up strong. On the whole, the disease is not very fatal, but repeated attacks of it lead to the transudation of serum and œdema of the brain, which may result in imbecility or paralysis.

Treatment.—This is similar to that which has been recommended in simple meningitis. In severe cases that are seen early, where the pulse is strong, leeches to the scalp may be necessary. Dr West records the case of a little girl, two years of age, who was seized with convulsions and congestion of the brain preceding the eruption of smallpox. He bled to three ounces, then applied eight leeches to the head, and gave active cathartics, without much benefit. The restlessness, squinting, and rolling of the head continued, notwithstanding he applied eight more leeches to the head, which "bled profusely, and the bleeding was followed by great diminution in the convulsive movements."† The eruptive disease ran its course favorably, and the child recovered. Bloodletting, as a rule, will not be necessary. It is important to be extremely cautious in the abstraction of blood, for young children bear the loss of it badly, and we commit a serious error if we draw too much. When the symptoms are relieved we should at once arrest the bleeding, but if they return, and the head is hot, or there is drowsiness, convulsion, or threatening coma, then we must repeat the bleeding if the strength of the child seems to warrant it. A dose of calomel to act as a purgative is often advisable. The syrup of senna, or the sulphate of magnesia and nitrate of potash mixture (Form. 8), will be necessary, and if these are not effectual then an active enema may be needed. Starvation, or little else than cold water to drink, must be enforced. The head should be shaved and elevated, and cold applications applied and cautiously proceeded with. The ice-cap is excellent, and where this is not at hand, pounded ice, applied in two bladders, and placed one on either side of the head, behind the ears, will be advisable. The patient's room should be dark, quiet, and cool. If the head symptoms are owing to the exanthemata, as soon as the eruption of the particular disease has appeared they usually subside, and the case from that time pursues a favorable course. When they appear to be the consequence of indigestion, or an overloaded state of the stomach, they pass away as soon as this organ is once again put in right working order; but the cause must be ascertained, lest we commit an error in management.

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* See Chap. XLI, pp. 540 and 552.

† 'On the Diseases of Infancy and Childhood,' 1859, p. 40.

In these cases, the first point to be attended to is the tension of the artery, which must be our guide. If it is full and incompressible then it is clear that our treatment must be directed towards the lowering of this arterial tension. To dilate the arterioles of the rest of the body is one means towards attaining this end; to abstract blood is another. Formerly the practice would have been to bleed the child, or to apply leeches, probably also to purge freely. Now we would prefer to deplete the congestive brain by vascular depressants. Rasori's plan of the free administration of tartarated antimony held its ground for many years, but disastrous consequences often resulted from the free use of it. Then comes the treatment of Fleming, viz. that of lowering the heart's action and dilating the arterioles by the exhibition of aconite. Aconite lowers the heart's action at the same time that it dilates the arterioles, and thus lowers arterial tension—otherwise the blood pressure in the arteries.* It is well, also, to act freely on the bowels, and therefore a purgative should be added to the vascular depressant. This is the more necessary as constipation is frequently associated with the head affections of children. Purgation ought to be maintained until all the symptoms of congestion have passed away. When the congestion is accompanied by chronic spasms, heat of head, and injection of the conjunctivæ, then it is well to give bromide of potassium, or even chloral hydrate.

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* See "The Action of Aconite," Chap. IX, p. 91, and Chap. XXXVII, p. 430.

Apoplexy, or cerebral hæmorrhage, is rare in infancy and early life. Excessive congestion of the sinuses of the brain takes place, and of the vessels which ramify over its surface, followed by rupture. When the brain is sliced, numerous small red spots are seen in all directions, from which blood oozes, and the white substance has in some cases a pale pinkish tinge. The hæmorrhage may take place into the cavity of the arachnoid (*meningeal*), or the substance of the brain, or very rarely into the ventricles (*cerebral*). The former is the most frequent.

This affection is most common during the first few weeks of life, but it may come on during whooping-cough, convulsions, and any complaint in which there is a strain thrown upon the cerebral vessels, or the blood is impeded in its return from the head, as in congenital heart disease, or affections of the bronchial glands pressing upon the large vessels. It is possible, too, that the brain may have sustained some injury during parturition; when the head in its slow transit through the pelvis has been subjected to long-continued pressure, the face and the scalp attesting what has taken place within the skull. After a protracted confinement, or where the mother has been subjected to puerperal eclampsia, the child may be born with hemiplegia of the face, arm, and leg, showing that hæmorrhage has taken place into the corpus striatum.

The condition of the cerebral vessels in early life is entirely different to that of the adult; the arteries being elastic and yielding, congestion is favoured, but rupture is less likely to occur, because their coats have not undergone the degenerative changes which are common in mature life. It is true that the coats of the cerebral arteries are very thin, since, owing to the unyielding structure of the cranium which encapsules the brain, they are more protected against blood pressure than in softer parts of the body, where the arteries can expand to a greater extent. Morbid conditions, such as unusual softening of the substance of the brain, may allow of expansion of its thin-walled arteries to a dangerous extent. Fits of convulsion, attacks of violent coughing, which produce enormous fulness of the chief vessels of the brain, rarely lead to rupture, but the smaller vessels may give way, and cause hæmorrhage. Purpura and the exanthemata are also occasional causes. The hæmorrhage varies in extent. When there are a few dots, the size of a pin's head, it is termed capillary hæmorrhage.

The *symptoms* which denote this condition vary according to the suddenness or gradual approach of the seizure. When sudden, there may be stupor and convulsions, coma or collapse, alternating with spasmodic contraction of the fingers and toes in the intervals.*

When an extravasation is small, the symptoms may be obscure or even absent, but when large, and it occurs in the substance of the brain, or in the cavity of the arachnoid, the usual symptoms of compression may be looked for. The child lies in an unconscious state, with a dusky face and contracted pupils, the eyes are dim, the pulse is small, the respiration is irregular, and usually slow and superficial. Vomiting is often present, and the bowels may be constipated or loose. A severe attack of cerebral hæmorrhage is accompanied with involuntary evacuation of the urine and fæces. If the child is fed at the breast it loses its hold of the nipple, and cannot retain it in the mouth. In larger effusions in older children, the attack is usually sudden; headache, restlessness, and disturbed sleep, unconsciousness, loss of speech, convulsions, hemiplegia and irregular breathing may be the precursors of death. In the commencement of the attack, the temperature generally falls to 96° or 95°, from irritation of the controlling centres of heat production; while, later on, more especially when the blood breaks into the lateral ventricles, the temperature begins to rise. Where this rise is sudden and extensive, as when the mercury runs up to 103° or 105° in a few hours, it is a sure sign of impending collapse and death.

Treatment.—The most perfect rest should be enjoined. When the case is seen early, leeches to the head have been recommended, but, as a rule, this will be rarely necessary, a dose of calomel and purgative enemata being usually active enough for a child. The head should be shaved and cold applied. If the gums are distended they should be lanced. Bromide of potassium and belladonna may be indicated to quiet the heart's action. Under this mode of treatment the symptoms may disappear.

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* West, 'On the Diseases of Infancy and Childhood,' 1859, p. 61.

CHAPTER XLV

CHOREA OR ST VITUS'S DANCE

Definition and Symptoms—*Sometimes begins insidiously, or with convulsive movements of face—Difficulty of speech and deglutition—Inability to stand or walk—Shuffling movements as if paralysed—Quietude during sleep as a rule—Disorder of digestive organs—Foul breath—Constipation—Hemichorea—General chorea—Cardiac murmurs—Palpitation—State of the urine.*—Causes—*General debility, anæmia, worms in the intestinal canal—Irritability of the nervous system—Female sex most liable—Fright, anger, blows, or injury—A sequence or association with rheumatism—Masturbation.—Association with epilepsy—An occasional consequence of the eruptive fevers.*—Pathology—*Theory of embolism—Hyperæmia of the nerve centres—Thickening and vegetations of mitral valve—Congestion and hæmorrhage of corpora striata and thalami optici—Congestion of the spinal cord.*—Prognosis.—Treatment—*Rest in bed—Utility of purgatives—Conium—Hypodermic injection of curara—Hyoscyamia—Hydrate of chloral—Iron—Bromide of potassium—Arsenic—Strychnia—Sulphate of zinc—Phosphorus—Hypophosphite of soda—Cod-liver oil—Quinine and bark—Tartarated antimony—Massage—Moral management—Sea-air—Shower-baths—Gymnastic exercises.*

Chorea may be accepted as one of the most singular of the numerous disorders which affect the nervous system. It is substantially allied in some respects to other neurosal conditions; but it is so variable and capricious in its manifestations that it may be clinically recognised as possessing peculiar and independent phenomena, which distinguish it from all other affections.

Chorea is a functional derangement of the motor nerves, causing irregular movements of the muscles, and influencing voluntary action. It is a common disorder in nervous and sensitive children from the greater excitability of the nerve-cells in youth. It is not accompanied by fever. With it there is no defect of consciousness or volition, as is the case with epilepsy.

Symptoms.—The disease occasionally creeps on slowly and insidiously, the child being out of health for some time before any choreic movement is observed. The first symptoms are restlessness and inability to sit still for even a short time, and the parents not unnaturally ascribe this to a fidgety habit, which may and ought to be controlled by discipline. In some cases, the disease begins with a slight twitching of the muscles of the face, the patient putting the mouth into the most grotesque forms and contortions, as if mocking or "making mouths" at you. In other instances the facial muscles escape and the tremulous agitation is confined to the limbs. When asked to put out the tongue it is accomplished suddenly, or with a peculiar rolling motion, and then withdrawn in like manner; but it is sometimes protruded with ease, and kept out for a short time. Eating and swallowing are performed with difficulty and the food drops from the mouth because there is no control over the tongue and pharyngeal muscles. The speech is often thick and hesitating, and the child twists and turns its mouth and head in the endeavour to get out a sentence. There is a general unwillingness to utter a word, and the tongue is sometimes bitten in the attempt to speak. After a time the disease extends to one or both arms, and later on to the legs, and thus all the voluntary muscles become implicated in spasmodic action. The child, if a female, will perpetually pluck at her dress, raise her hand to her head as if to play with her hair, or rapidly put it behind her; she will be noticed at this stage to drop things out of her hand, and to be unable to hold or direct her pencil when at school. In walking she leans on one side, drags one leg, or raises it awkwardly. Her walk is a jumping, unsteady, sudden, shuffling kind of gait, as though the joints hung loosely, and she was compelled to put herself together before making the attempt. The manner of locomotion is ludicrous and fantastic in the extreme, the writhing of the shoulders, the careless semi-drunken sway, and the peculiar grimace, or fatuitous expression of the features are all characteristic. In severe cases sleeplessness is common, and even in moderate cases the child is often wakeful. The movements almost invariably cease with sleep and the abolition of consciousness.

In severe cases the patient is unable to stand or walk. The knees and elbows may be polished from friction, and even the skin abraded; the chin is red, and the lips sometimes bleed from biting and friction against the pillow. So violent are the paroxysms that the back may be arched one moment, and stiff and straightened the next. The speech may be unintelligible, and the emaciation become extreme if the case goes on. The pulse is not accelerated except from debility and nervous agitation. In some cases it is slow, and may not exceed sixty beats a minute in a child of thirteen years of age. Irregularity and intermission of the pulse are often present.* The tongue is sometimes furred, the breath is foul, and the bowels are constipated. The patient is liable to great variation in the progress of the malady, being sometimes better and sometimes worse. When the attacks are threatening there may be mental irritability, and evidence of spitefulness. In one case that came under my notice a child whose intellect was below the average, was unable to restrain herself from kicking and biting those about her. An inclination to be wicked and mischievous is not uncommon. The child seems bent on doing that which is wrong; the feelings and emotions are no more under control than the movements of the limbs. In chronic cases, parents can often judge when an attack is threatening, or when the case is becoming worse, from the altered manner and disposition of the child. Timidity, caprice, and wilfulness are noticeable when the intellectual faculties are disordered, and it is in such cases as these that we may see fits of passion pass into temporary unconsciousness. I have known the symptoms much aggravated by another patient in the same ward similarly affected, or suffering from a painful disease which has irritated the child. This is the only explanation I can furnish of a choreic child's temperature going up to 102° for three nights, and falling next day to normal when removed into another ward. Sir T. Watson mentions in his lectures that chorea is liable to be propagated by a species of contagion, or rather involuntary imitation.†

Sometimes the loss of power of co-ordination is so great that the patient cannot pick up an object with the fingers, or even grasp anything with the hand.

In one case under my care the choreic movements were preceded by headache of three months' duration which had not been previously experienced. The patient was a girl ten years of age, who had become very anxious about her studies. In another case, a boy ten years of age, had severe neuralgic headache for weeks before the chorea showed itself, when it ceased. This symptom of headache, according to my experience, is rare, except as the accompaniment of anæmia and debility. Sir T. Watson has frequently met with instances of pain in the head in chorea; and in some of them with pain on that side *only* of the head which was opposite the agitated limbs.[*]

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* See a paper by the author, "On Neurosal Affections of the Heart in Children," 'Practitioner,' Sept., 1878.

† 'Principles and Practice of Physic,' 4th edit., vol. i, p. 668.

Chorea is very prone to recur, and a child, who has had one attack is always exposed to a return at some future period. "Out of 80 cases, 25 had been attacked before, of the 25 cases, 8 had had it twice, and 3 had experienced it four times. Of the 25 cases, 19 recurred in the spring."[†] Of 39 cases under my own care, 16 suffered from it twice, 6 three times, 1 four times, and one 5 times.

When the spasmodic movements are unilateral, affecting the limbs of the same side, the patient is said to have "*Hemichorea.*" When this happens, the right side is oftener affected than the left. Both legs may be affected, and only one arm; or one arm alone, whilst the legs are free. In rare cases, one arm and the leg of the opposite side of the body may be involved. When all the voluntary muscles are implicated there is "*general chorea.*"

Heart disturbance is often enough met with in chorea to justify the conclusion that it has some connection with the disease, which neither rheumatism, anæmia, nor any other blood change can explain.[‡] Heart symptoms in chorea occur most frequently during a period which is included between two years of age and about seven or eight. The age of greatest liability to choreic heart disturbance thus nearly coincides with the age of greatest liability to chorea.[§] In some cases there is increased action and impulse of the heart, or a bellows murmur may be heard at the apex, with other signs of mitral regurgitation. When the heart is so affected it is sometimes traceable to rheumatism to which we will shortly allude. A soft systolic murmur, audible at the left apex, may, however, arise in the course of the chorea apart from rheumatism, lead to no injurious consequences, and disappear with the cure of the complaint. In other cases the neurotic disorder has implicated the cardiac plexus, and produced irregularity of rhythm, without murmur. In fact the heart suffers like the voluntary muscles, and is in sympathy with them. The youngest children are most liable to this irregularity. Out of my 39 cases, the heart was normal in 33 cases, irregular in 4, and there was valvular disease in 2. Of 132 cases of chorea under the care of Dr Sturges, "the proportion of heart disturbance (heart murmur or irregularity) is 40 per cent. in the younger children, and 32 per cent. in the older ones."* As a rule, the health is undisturbed in cases of irregularity, and recovery is not influenced by it. In some cases, the first sound is prolonged at the apex and over the pulmonary area; there is a soft systolic murmur, in fact, which though sometimes significant of organic change may happen in anæmia and debility. But the choreic murmur may be independent of rheumatism, or anæmia; it may be loud at one time and scarely to be detected at another. It is rarely audible in the axilla or angle of the scapula.

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[*] Op. cit., vol. i, p. 673.

[†] 'Nervous Diseases,' by S. Weir Mitchell, M.D., 1881, p. 137.

[‡] See Chap. XL, "Diseases of the Heart."

[§] 'Chorea,' by Dr. Sturges, 1881, p. 53.

Owing to the heart's action being frequently disturbed in chorea, palpitation is sometimes severe and violent, and there may be a systolic mitral murmur of functional or dynamic origin, which passes away with the seizure as the general health is restored, thus proving that there is no structural change in the valve itself.

The *urine* should be carefully examined in chorea, because to some extent it aids us in the treatment, for the functions of digestion and assimilation are in young children at the root of much nerve disturbance. It will generally be found of high specific gravity, often excessively acid, containing an excess of urea, sometimes an abundance of urates, at other times phosphates. One of my patients, who had heart disease associated with chorea, occasionally passed a large quantity of uric acid crystals, and when she did so the muscular movements were invariably worse. This is rather what we might expect, since among adults, excessive nervousness is often seen in connection with the deposit of uric acid in the urine. The urine may, however, be absolutely normal for days together, and remain so throughout the attack, even when the movements are excessive. Of 39 cases, under my own care, the highest specific gravity was 1032 in four cases, in ten cases it was 1028, in nine cases it was 1030. In one instance it was as low as 1004. Pale urine of low specific gravity where there is much debility and exhaustion is what we may expect to find in delicate and exsanguine girls. In many cases, without any apparent cause, the urine will undergo a great change in this respect, and vary almost from day to day, though the patient is taking the same medicine and living under the same circumstances. A case of "*Chorea with unusually severe symptoms*" is recorded in a lad of 16, where the urine reached a specific gravity of 1046, and a few days later 1055.[*] In the case of a choreic girl, æt. 11, under the care of Dr Handfield Jones, the urinary elimination on admission was low, but when convalescence was established, "the urea was more than threefold, the phosphoric acid nearly fourfold, the uric acid more than fivefold what it had been before." In the second case, a girl, æt. 13, the excretion of urea was enormous during the choreic period, being no less than 10 grains per 1 lb. of body weight, whilst the phosphoric acid excretion was "no less than 60 grains during the acme of the disease, and only 14·5 during convalescence." In the latter the uric acid was nil in the decline of the complaint; in the former it was increased to fivefold. The author accounts for the difference in the two cases on the ground that the first patient had been ill eight weeks before admission, whilst the second had been ill only about a week.[†]

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* 'On Chorea,' 1881, p. 49.

The influence of sex and age is considerable. Girls suffer from it more than boys, the proportion being about three girls to one boy. Of eleven choreic patients under Vogel, only one boy was affected.[‡] Of 39 cases under my care only four were boys. Of 775 children who were admitted as in- and out-patients of the Children's Hospital, 449 or 64 per cent. were girls; all were under ten years of age, and 66 out of 102 were under the age of five.[§] Of 422 cases occurring up to twelve years of age, 122 were males, and 300 females; between the ages of four and five the proportion of males to females was 4 to 16, and between ten and twelve, as 23 to 81.[||] According to Dr Radcliffe, the two sexes are equally liable up to nine years of age, and after this age females are liable in the proportion of nearly 5 to 2.[¶] The late Dr Day of Stafford found it most frequent between six and eleven years of age.* Of my 39 cases, 17 were under ten, and 22 over, the youngest was five and the eldest fourteen.

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[*] 'Brit. Med. Journ.,' vol. ii, 1882, p. 789.

[†] "On Cases of Chorea with Urinary Analyses," 'Clin. Trans.,' vol. iv, p. 90-91.

[‡] Op. cit., p. 398.

[§] 'On some of the Disorders of Infancy and Childhood,' by C. West, M.D., 1871, p. 47.

[||] 'Croonian Lectures,' by J. Braxton Hicks, M.D., 1877.

[¶] Reynolds' System of Medicine,' vol. ii, p. 188.

Causes.—These are *predisposing* and *exciting*. Among the former are defective nutrition, general debility, and anæmia. Hence it is that children who suffer from secondary syphilis or who have had scarlet fever, or measles, or whooping-cough are liable to the affection. Insufficiency of food has a small share in the production of the disease. Any circumstances may originate it which tend to lower the standard of health in those who are spare, thin, and nervous. This is probably the reason for the great frequency of chorea among young persons engaged in pottery manufacture as stated by Dr Arlidge.† Irritability of the nervous system is among the most common causes, and is assigned as one reason of its frequency in the female sex. Over-anxiety in school work and hereditary nervous disease especially predispose to it. Hysteria in the mother, epilepsy in the father, melancholy, suicide, or insanity in the parents can be frequently traced. The children of consumptive parents are also liable to it. In a family I once knew, one daughter had severe chorea, the other died of convulsions, a son perished from phthisis, the mother died of paralysis, and the father committed suicide.

The *exciting causes* are fright, anger, and timidity. Several cases have come before me in which the disease has been traced to terror and alarm. One of the worst cases I ever saw came on suddenly in a girl, 10 years of age, from seeing a dead person. In another case which came under my notice in February, 1879, a girl, 8 years of age, had three severe seizures; the first from grief at the death of a sister, the second from seeing a lady killed in the street, and the third from hearing of the sudden death of her grandfather.

Worms in the intestinal canal may act as an exciting cause in nervous subjects.

The lower classes are most liable to this complaint, then come the middle classes, and lastly the upper classes.‡

The relation of chorea to acute rheumatism is a matter of much interest, and among writers there is a difference of opinion on the point. Rheumatism is a common complaint in childhood, and is as likely to be associated with chorea as any other disease, but this does not involve any direct intimacy of cause or effect. In a large number of cases there seems to be no necessary connection. From all that is known on the subject, it would seem that in a large number of cases chorea rarely follows or precedes rheumatism, by which I mean genuine examples of the disease, and not merely obscure articular pains without redness or swelling, which after all is of a doubtful nature. "Thus the whole 132 cases (previously mentioned) give 7 who have had rheumatic fever; 14 to 16 who have had pains probably rheumatic; 6 who were doubtful, and 5 where the facts were not ascertained."*

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* 'Medical Society's Proceedings,' vol. iv, p. 85.

† "Pathology of Chorea," 'Brit. Med. Journ.,' 1877, vol. 2, p. 799.

‡ 'Collective Investigation Record,' July, 1883.

Dr Dickinson's Clinical Table of 70 non-fatal cases, gives 18 dependent upon, or possibly connected with rheumatism. In only 14 of the 70 cases were the heart's sounds natural. "They were merely irregular in 11; reduplicated or unnatural but still without murmur in 3; while in 42 of the cases valvular murmurs were found, accompanied in 16 instances with marked irregularity of action. Thus the total irregularity reached 27, or more than a third of the whole. In the 42 instances in which valvular murmurs were found, these were systolic in every instance; at the apex only in 34 cases; at apex and base, in 6; at base only in 2. In one instance pericardial friction of some standing was audible."†

Of 66 cases of chorea observed by Dr West, 16 were accompanied or preceded by rheumatic symptoms, and in 11 of these, there was a systolic bruit persisting after convalescence in 10. In one of the 16 cases, rheumatic symptoms and heart disease *followed* in the course of the chorea, in all the other cases the rheumatism preceded it. In 9 cases, although there was no rheumatism present, nor any history of rheumatism, the heart was the seat of valvular affection when the patients came under observation. Although these complications are sometimes associated with chorea, they may be accidental and due to the frequency of rheumatism in young subjects.

These facts make the relation to endocarditis very interesting. In a large proportion of cases the cardiac valves are fringed with fibrinous vegetations, whether there has been rheumatism or not.

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* 'Chorea,' by Dr. Sturges, 1881, p. 33.

† "On the Pathology of Chorea," 'Med.-Chir. Trans.,' vol. lix, p. 33.

When there has been no history of a rheumatic attack, and these vegetations are present, it is supposed the papillary muscles contract in a peculiar way, from some abnormal condition of the blood, or from irregular action of the muscular system. Inflammation being thus set up, and the valve not closing properly, regurgitation takes place into the auricle.[*][†]

When there is no rheumatism, and no history of rheumatism, and there is a persistent cardiac bruit at base or apex, it is naturally ascribed to organic change in the aortic or mitral valves, as a consequence of the chorea. Even though the murmur be mitral and organic, as the result of endocarditis, it may pass away entirely, if the amount of lymph deposited on the valve be very small.

From an analysis of 172 cases admitted into the London Hospital, Dr Stephen Mackenzie concluded: 1. That some cardiac abnormality is present in more than half the cases of chorea. 2. That this is due to endocarditis affecting almost exclusively the mitral valve. 3. That in over 80 per cent. of the cases the heart lesion persists. 4. That rheumatism has pre-existed in nearly half the cases, and that in nearly all of them it is the cause of the heart murmurs which frequently attend chorea.[‡]

It is singular that, if the relation of rheumatic fever to chorea is so close, the latter disease should generally select female children, who are more easily alarmed, and whose nervous system is more excitable. Of 39 consecutive cases under my care, there were only two cases of heart disease among the whole number, and these lesions were independent of rheumatism, the patients never having suffered from it.

A case of chorea is related by Dr Althaus, where it came on from masturbation at fifteen years of age, and, after lasting for six years, it became complicated with epilepsy. Arsenic, bromide of potassium, and various nerve-tonics and sedatives failed. Hydrate of chloral checked the restlessness and general convulsions till the patient got into the habit of taking immoderate doses, and at last died in 1874.[§]

Pathology.—There are two theories extant, one in which the disease is attributable to embolism, and the other to hyperæmia.

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[*] 'On Diseases of the Heart,' by E. Sansom, M.D., 1876, p. 136.

[†] Wilks, op. cit., p. 347.

[‡] "On the Relationship of Chorea to Rheumatism," International Medical Congress, Lond., 1881, Sect. vii, p. 419.

[§] 'Clin. Trans.,' vol. xi, p. 62.

Both have found able advocates. The embolic theory appears to me inconsistent with the history and clinical features of the disorder. Of seven fatal cases in which Dr Dickinson made post-mortem examinations he found no plug of fibrin in any of the arteries. Of twenty-two fatal cases which he examined, the frequency of mitral endocarditis was noticeable.* He believes the disease to consist in hyperæmia of the nervous centres, particularly of the corpora striata and thalami optici, and that congestion, in the cervical, dorsal, and lumbar portions of the spinal cord, is frequently to be detected. Dr Broadbent has seen one fatal case of rheumatic chorea with delirium, in which there was plugging of minute vessels of brain with decolorised clots.† Dr Hughlings Jackson has met with emboli in the small arteries, and others have seen them in the corpora striata.‡ The slow manner in which the disease so frequently creeps on, and returns from time to time at uncertain intervals, the occasional sudden disappearance of the disorder, and the seizures being often general instead of one-sided, are not consistent with the theory of embolism. Dr Handfield Jones truly observes, "that there seems no more reason for requiring a demonstrable lesion in chorea than in many cases of insanity or delirium tremens, between which and chorea a considerable analogy certainly exists."§ Dr Wilks does not think that chorea is due to any special disease of the spinal cord or nervous system. "The common cause of fright would seem to show that the first shock was mental, or imposed on the cerebrum. The condition is one in which the nervous centres have become irritable, lost their power, and the will is incapable of directing their action."‖

In two cases of "canine chorea" there was found after death, in one case, a granular and swollen condition of the nerve-cells of the spinal cord, and in the second case there was seen, in addition, a similar lesion in the medulla oblongata and cerebellum, while the corpora striata and hemispheres were free from it.¶

When chorea is associated with temporary loss of consciousness and with convulsive seizures (hysterical or epileptoid), Dr Gowers thinks the disease may depend on an unstable condition of the nerve-centres, or on imperfect development or nutrition of these centres. He mentions several cases illustrating the association of chorea with epilepsy.*

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* "On the Pathology of Chorea," 'Med.-Chir. Trans.,' 1876, p. 25.

† 'Lancet,' Oct. 16, 1875, p. 560.

‡ Ibid.

§ 'On Functional Nervous Disorders,' 1870, p. 355.

‖ 'Diseases of the Nervous System,' 1878, p. 348.

¶ "The Pathological Anatomy of Canine Chorea," by W. R. Gowers, M.D., and H. R. O. Sankey, M.R.C.S., 'Med.-Chir. Trans.,' 1877, p. 229.

In some fatal cases evidences of inflammatory lesion have been found in the lungs, pleura, brain, peritoneum, and spinal cord (myelitis), and there have been also noticed hyperæmic patches of extravasation in the coats of the aorta and endocardium, when these did not depend on rheumatism. The chorea probably possesses the tendency to so affect the nervous centres as to destroy the balance that normally exists between them and their vascular supply. Perhaps the most frequent change is that of "vegetations," or fibrinous deposit on the valves of the heart. Dr Wilks remarks that he has never seen a fatal case of chorea in which there was not some evidence of previous endocarditis; that is, the inner surface of the mitral valve was lined by a narrow row of bead-like vegetations,† although in some of the cases there was no history of rheumatism, and no audible bruit. In 34 fatal cases, 18 presented these alterations, and there was scarcely one of them in which the changes could be traced to embolism (Handfield Jones).

Prognosis.—Uncomplicated chorea is never fatal. Out of 100 cases Dr Strange, of Worcester, did not meet with a fatal case.‡ This quite agrees with my experience. If the disease is attended with peri- or endo-carditis, or the movements are excessive, and the child cannot swallow food, then there is danger to life. In cases about to end fatally, high temperature, great emaciation, and death from exhaustion or coma are frequent. The average duration of the disease is from six to ten weeks.

Treatment.—Rest in bed is the first and most important step to observe, and with rest alone there is no doubt that many cases recover. Drugs exert only a secondary influence. Where the convulsive movements are incessant, splints softly padded should be applied to the limbs, and it may be even necessary to cover the body with cotton wool to prevent the patient from sustaining bruises and excoriations. It is advisable to remove any excentric source of irritation wherever it may exist. If there is feculent matter in the bowels and constipation, as frequently happens, mild purgatives, such as rhubarb and castor oil, are to be selected. In some cases, where the muscular agitation is great, free purging will be followed by rapid improvement, and this preliminary treatment ought never to be omitted if there is any reason to suppose that the intestinal tract is disordered. Unhealthy motions, scanty and high-coloured urine demand this treatment.* A case of acute chorea in a girl of nine, which had lasted a month, is referred to by Dr Handfield Jones. The attack was very aggravated. The movements were incessant, and there were sordes on the lips, a bed-sore, rapid feeble pulse, and a tendency to sinking. After a dose of male fern, a tapeworm, seven yards long, came away, and in a few days the convulsive movements ceased, and the child recovered completely.†

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* 'Brit. Med. Journ.,' April 6, 1878, p. 481.

† Op. cit., p. 395.

‡ 'Brit. Med. Journ.,' 1881, vol. ii, p. 69.

To relieve the dryness of the skin, which is frequent in chorea, and to produce moisture, a warm bath at bedtime should be employed, and this has been recommended and adopted both by English and Continental physicians. Sulphur baths have been highly spoken of by French writers.

Succus conii has been recommended, but my experience does not enable me to speak in its favour. We do hear of and see cases where two drachms have produced certain physiological effects, as dimness of vision and dilatation of the pupil, but I have given sixteen drachms in the space of twenty-four hours without producing any sedative effects whatever; indeed, in the case to which I refer, of chronic chorea, the child, aged 10 years, was no more affected than if she had taken water only. Dr West gives similar evidence regarding the use of this drug, and also of henbane and belladonna. He has known them to be tolerated in poisonous doses without any result for good or evil.‡ Curara is another remedy.§

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* Form. 84:

℞ Potass. Sulphat. gr. x
Pulv. Rhei, gr. iv. } M. To be taken in the early morning. For a child ten years of age.

† 'On Functional Nervous Disorders,' 1871, p. 355.

‡ Op. cit., p. 72.

§ Dr Drummond, of Newcastle-on-Tyne, succeeded in curing an obstinate case of general chorea in a girl seven years of age, by the subcutaneous injection of curara. He commenced with an aqueous solution of gr. $\frac{1}{48}$ for two days, increasing the dose on the third day to gr. $\frac{1}{30}$, and the next day to gr. $\frac{1}{10}$, on the fifth day to gr. $\frac{1}{8}$, and on the sixth day to gr. $\frac{1}{6}$, by which time the patient had recovered complete power over the voluntary muscles. Two days later gr. $\frac{1}{4}$ was administered, and then there was no return. ('Brit. Med. Journ.,' June 15, 1878, p. 857.) In a chronic case of chorea, which was admitted into the Samaritan Hospital under my care, in October, 1878, I determined to try the curara. The patient was a girl eleven years of age, and had been

Dr Pulmont found that gr. $\frac{1}{40}$ of hyoscyamia augmented to gr. $\frac{1}{3}$ twice a day, proved very efficacious in chronic cases in adults, the improvement usually setting in in the course of eight or nine days. Symptoms of intoxication were occasionally observed, indicated by dryness of the mouth and dilatation of pupils.*

Chloral hydrate has been recommended in large doses in violent chorea.† The principle of treatment was to give thirty grains, and to repeat the dose, or half of it, if the patient did not obtain ten hours' sound sleep in the twenty-four hours. On waking, a second dose was given in proportion to the ascertained effect, but always less than the first. On waking again another dose less than the second, and so on till the amount of sleep had been obtained, when the chloral was discontinued till the next night. In a case of acute chorea, in a girl, aged nine, I found five grains every night produce most tranquil sleep, and it was not necessary to continue it after one week. In another case, a girl of 13 took ten grains every two hours at first, and afterwards every four hours. The

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under my care on three previous occasions for the same disease. There was incessant agitation of the arms and legs, and it was necessary to keep her in bed. The heart's action was rather thumping and excited, and there was a soft systolic bruit over the apex. After taking hypophosphite of soda and iron, as well as cod-liver oil, she was not manifestly better, and any excitement or talking would make her very fidgety, and increase the muscular movements. On the 15th of October, I injected into the right forearm gr. $\frac{1}{60}$ of curara with the following effect:—16th.—10 a.m., no effect; 11 a.m., gr. $\frac{1}{40}$ injected; 2.30 p.m., no change, pulse 72, gr. $\frac{1}{30}$ injected; 6.45, since the injection she has been much quieter, and lying perfectly still with complete command over the limbs, pulse 80, inclined to sleep. 17th.—She had an excellent night, and slept better than she had done for some time past, but agitation was returning in the arms, and I now injected gr. $\frac{1}{30}$ at 10.45; at 6.45, as there was no further improvement, I injected gr. $\frac{1}{15}$. 18th.—Slept well, quite steady in arms and legs; injected gr. $\frac{1}{15}$. 19th.—2 p.m., she had remained quiet; gr. $\frac{1}{15}$ injected. 20th.—No injection used, but after 2 p.m. the limbs became more agitated, and the muscles of her face were more in action. 21st.—The mouth, hands, and legs were moving more. The effect of the curara has been to keep her quiet for twenty-four hours, and then it passed off. I must admit that the drug partially answered my expectations, and I should be disposed to employ it again when the agitation is great, because it controlled the movements, and caused neither headache, sickness, nor any unpleasant symptom. One difficulty is the alarm which the injection causes. I now gave sulphate of zinc, beginning with three grains three times a day, and gradually increasing to forty grains twice a day, without causing sickness, nausea, or loss of appetite. The effect of this treatment was to cause a great deposit of phosphates in the urine, but the remedy in these large doses did more good than any other that was employed.

* 'Bull. Génér. Thérapeutique,' Aug. 3rd, 1876.—Quoted from the 'Practitioner,' October, 1876.

† 'Practitioner,' March, 1877, p. 173. By Robert Bridges, M.B. Oxon.

effects were, to procure sound sleep, which she had not obtained for a week before admission into hospital; to raise a small and weak pulse of 64 to 76, and to calm the muscular movements. Good diet, and four ounces of sherry, were given daily. When sleep was obtained, the cure was completed with iron, and large doses of sulphate of zinc.

Hydrate of chloral is a valuable remedy in some cases of chorea, particularly in those where vascular excitement is present, and the pulse is good. Dr Althaus considers that the theory of chorea is explained by active hyperæmia of the corpora striata, and the parts surrounding the fissure of Sylvius, and that the beneficial action of hydrate of chloral is to be attributed to the anæmia which it produces in these structures. Its dangers as a depressant are nothing compared to the repose and rest which it ensures to the nervous system, lessening as it does, in suitable doses, the extreme agitation of the limbs, and the violence of the choreic movements. Sleep so obtained gives the necessary time for repair to the over-excited parts, and will be found to succeed when morphia yields no result. The patient wakes able to swallow food, which he may not have done for weeks or months. If then there is delirium or sleeplessness, chloral, opium, or morphia, to allay mental excitement and procure rest, will be needed.

In some cases, where the disease has lasted a very long time, the patient passes into that stage of chronic chorea or agitation which is likely to become permanent, and there is no further prospect of benefit from treatment. The only thing to be done in these cases is to maintain as far as possible the general health, and to avoid the strain of school work; and as puberty is reached the disease may be thrown off altogether.

Bearing in mind that the disease is one which rapidly induces exhaustion, the constant supply of nutritious food, easy of digestion, is imperatively demanded. The free employment, too, of stimulants may be necessary to support the nervous waste. I found the liberal use of brandy prove of great benefit to a girl, eight years of age, who was much exhausted from perpetual agitation of the limbs.

Iron is one of the best remedies we possess in chorea, and mild cases, especially if there is anæmia, often yield to it. Where the movements are slight, some preparation of iron may be given alone, and most of such cases will be cured by it. When the movements are frequent, the addition of bromide of potassium is an excellent formula. The bromide may be combined in these cases with the ammonio-citrate of iron, the syrup of phosphate of iron, or the citrate of iron and quinine. The syrup of the iodide of iron is a preparation very highly recommended by some authorities. It was first proposed by the late Dr Barlow, and given by him with great success.

Arsenic is a valuable remedy, improving nutrition and acting as an admirable tonic. Children bear proportionately much larger doses of this drug than adults, five minims being generally the minimum dose. Several cases have appeared to me to yield to arsenic when given in plain water, and there is certainly evidence to show that it is a very efficacious drug when continued long enough and in sufficient quantities, small doses sometimes failing when large succeed. Dr Ringer says that in simple uncomplicated cases of chorea, arsenic is by far the best remedy.[*] Dr Begbie, after an experience of nearly thirty years, never knew this remedy to fail.[†] Few physicians can, I think, speak in such enthusiastic terms of it. If I employ arsenic I never abandon it till I give half a drachm during the day to a child 8 or 10 years of age. Whilst I have over and over again seen the best results from such treatment, I have never witnessed any harm from it. A choreic girl, nine years of age, who was under my care in 1880, took ten minims three times a day for twenty-three successive days, when recovery was complete. Five-minim doses did no good whatever.

Where anæmia is present, the citrate of iron and quinine, the ammonio-citrate of iron, steel wine, dialysed iron (Liquor Ferri Dialysatus) or reduced iron (Ferrum Redactum) may be given alone, or combined with the arsenic. The red oxide of iron is an old and successful remedy, and is still employed by some physicians. Children will readily take it when mixed with treacle. From ten to thirty grains may be given according to age twice or three times a day.

Strychnia has been employed by Trousseau, and as a nerve tonic it is rational to suppose that it will prove serviceable in certain cases. But its tendency to cause twitching of the muscles, as it will do in some cases, even in very small doses, renders it a doubtful remedy in this affection. The lad with severe chorea (p. 616) began with gr. $\frac{1}{30}$ three times a day, and the dose was gradually increased until he took gr. $\frac{1}{8}$ three times a day, when he recovered. During the time he was taking these large doses no unpleasant physiological symptoms were produced.*

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[*] 'Handbook of Therapeutics,' 4th edit., p. 280.

[†] 'Contributions to Practical Medicine,' 1862, p. 90.

Sulphate of zinc.—I have given this drug in doses of from one to five grains three times a day, and continued it for a week without producing any effects, and the remedy so repeatedly disappointed me that for some time I ceased to employ it. This most likely arose from giving it in too small a dose. Sir T. Watson gave it successfully in ten-grain doses three times a day in a severe case which had resisted other remedies. There can be no doubt that zinc sometimes succeeds where iron and other remedies fail. In prescribing it, the dose should not exceed a grain three times a day to begin with, and should gradually be increased till there is nausea or vomiting, or an amelioration of the symptoms. In a chronic case I began with two-grain doses twice a day, increasing the dose daily, till on the ninth day, the girl, seven years of age, was taking eighteen grains. For the first time this controlled the agitation, improved her voice and appearance, and caused no sickness. On the tenth day she took twenty grains three times a day, and on the twelfth day forty grains twice a day, without causing the least unpleasant symptom. The heart, which on admission was rather unsteady, with a soft apex bruit (owing to debility), became quiet and regular, and the murmur entirely disappeared. Among the chief signs of improvement was the strength of her voice, the ease with which she answered questions, and the control she had over the tongue and facial muscles. In another similar case no benefit resulted, and the patient only became a little sick after taking ninety-six grains in one day.

Sulphate of copper is used by Italian physicians for chorea.

Phosphorus in combination with iron is a good nervine tonic, and when persistent anæmia is present it should be employed. It often takes the place, or even supersedes the use of iron, restoring the tone of the nervous functions, and improving the quality of the blood. Dr Radcliffe speaks highly of the hypophosphite of soda in chorea. He gives from five to eight grains three times a day to children with unmistakeable benefit. In ordinary cases he also gives cod-liver oil with the hypophosphite of soda, and adds camphor or carbonate of ammonia, or both, according to circumstances. Of sixty cases so treated, the average duration of treatment was under one month.* I have frequently given, with advantage, five grains of the hypophosphite of lime and one drachm of the syrup of phosphate of iron in a tablespoonful of water twice a day.

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* 'Brit. Med. Journ.,' 1882, vol. ii, p. 789.

Quinine and bark are useful in their turn, and cod-liver oil is one of the best remedies.

I have never employed tartarated antimony in any dose, nor can I see a reason for supposing that it could prove of real utility. It seems a remedy likely to do harm from its depressing effect, though cases are recorded in which it has done good. Dr West has given it in very large doses—nine grains daily for three consecutive days, had no influence on the pulse, caused neither sickness nor diarrhœa, but remarkably abated the movements.†

Massage or shampooing often proves of great benefit. It should be employed twice a day for about half an hour at a time, and in many cases it lessens the movements and improves the wasted and flabby muscles, whilst it keeps up the circulation in the limbs. Before this is commenced the child should have a cup of milk or beef tea, it being most important to supply nourishing food whilst this vigorous treatment is carried out.

The subjects of chorea require to be managed with firmness and kindness, for the mind is often weak, and easily thrown off its balance. Any excitement, or severe reproof, will aggravate the condition, and invite exhaustion. The child requires to be lightly amused with pictures and cheerful surroundings, and encouraged to exercise control over their agitated limbs, which they can do to a great extent, when moral treatment is not neglected. Finally, sea air, shower baths, cold water douches, and gymnastic exercises, are useful in properly selected cases.

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* "Chorea," 'Reynolds' System of Medicine,' vol. ii, 2nd edit., p. 220.

† 'On Some of the Disorders of the Nervous System in Childhood,' 1871, p. 73.

CHAPTER XLVI

DISEASES OF THE SPINAL CORD

SPINAL IRRITATION AND CONGESTION.—SPINAL HÆMORRHAGE.—SPINAL MENINGITIS—*Symptoms*—*Pathology*—*Diagnosis*—*Prognosis*—*Treatment*.—MYELITIS—*Symptoms*—*Causes and treatment*.—CEREBRO-SPINAL MENINGITIS (CEREBRO-SPINAL FEVER).

AFFECTIONS of the spinal cord are obscure at all ages, and they are more so in young subjects than in adults; for whilst in the latter, any impairment of motor power or abnormal sensations would be at once complained of, in the former, serious mischief might proceed for some time before we are able to detect it.

It must also be admitted that examination of the spinal cord and its membranes after death is most unsatisfactory. The body allowed to remain on the back facilitates the gravitation of blood and fluids into the most depending parts by which the nervous tissue itself is altered, and the evidences of congestion and effusion, which are hastily attributed to disease, may be entirely due to position. This fact has struck most observers, and rendered an explanation of the changes discovered after death very confusing, and calculated to mislead. "First of all, as regards the much-abused hyperæmia, all post-mortem appearances must be excluded as spurious where the body was not placed upon its face immediately after death, and the autopsy was performed later than twenty-four hours after life terminated. Without this precaution there will be found in every case, even in the most normal, extensive post-mortem hypostasis, imbibition of the colouring matter of the blood, and putrid softening, by which it becomes totally impossible to establish the previous existence of any actual disease in the medulla spinalis."*

Spinal irritation and congestion.—The symptoms that denote this condition are more or less impairment of the motion in the upper or lower extremities, according to the seat or degree of mischief that may be present. There is pain of an obscure character in the cervical or lumbar region, languor, and failing health. In some cases the pain is severe enough to simulate disease of the vertebræ; there may be tenderness along the spine, and even some puffiness, and the degree of congestion may be sufficient to produce more or less stiffness of the neck, and pain on moving the head.

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* Vogel, op. cit., p. 376.

Dr West describes the case of a little boy, two and a half years old, who had *irritation of the spinal cord* from masturbation; he tottered in his gait, was indisposed to move, and at last almost entirely ceased to walk. When the bad practice to which he was addicted was put a stop to, he soon regained his health and the power of walking.*

He also relates two other cases in children of four and five years of age. In one case the symptoms began with failing health and stiffness of the neck, succeeded by the head being thrown back and motionless. Pressure over the cervical vertebræ gave pain, and the appearance and manner of the patient seemed to point to disease of the cervical vertebræ. The application of four leeches to the back of the neck was followed by sleep, and next morning there was no pain in the head, or tenderness of the spine, and complete power over the muscles of the neck.

In the other case, the child had a fall on her back ten days before she was seen by Dr West. The day following the fall she was unable to stand or move without support, and had continued in the same state ever since. There were heat of skin, frequent pulse, loss of appetite, thirst, and furred tongue; the bowels were constipated, but the urine was normal. The integuments from the tenth to the twelfth dorsal vertebræ were puffy, and there were pain and tenderness over the spine in this situation. Cupping to four ounces over the loins was followed next day by relief of the pain, and the power of moving her legs more readily. She recovered in a few days.

Spinal hæmorrhage—spinal apoplexy, or hæmorrhage into the spinal cord is extremely rare in children, but cases are on record. It may be the result of violence, or the consequence of some morbid action. The symptoms vary according to the situation of the hæmorrhage. There is sudden pain in the back, followed by paralysis of the legs, bladder, and rectum. In small hæmorrhages the symptoms are milder, and partial or complete recovery may occur. Dr Abercrombie has recorded the case of a child, seven years of age, in whom after an illness of three days death ensued from violent convulsions. A long and firm coagulum of blood was found external to the cord, extending the length of the cervical portion.*

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* Op. cit., 1859, p. 162.

Treatment.—The most absolute rest should be maintained in the recumbent posture, and digitalis and bromide of potassium given to calm the nervous system. The urine will require to be drawn off, and a laxative taken if the bowels are sluggish.

Spinal meningitis.—As the membranes of the brain are liable to acute and chronic inflammation, so are those that invest the spinal cord. Wounds of the spinal canal may cause the disease, or the extension of inflammation from the thoracic and abdominal parietes contiguous to the spinal column. The disease appears to be more common in new-born infants than in adults, and is considered to be pyæmic. In thirty cases of convulsions Billard found that there was meningitis of the cord in twenty, and only six of these presented inflammation of the cerebral meninges.†

Acute inflammation of the dura-arachnoid (*pachy-meningitis*) is rare; it may arise from disease of the vertebræ extending to the membranes, as from exposure to damp and cold, and from injuries. Meningitis, with an effusion of pus and fibrinous serum, has followed acute articular rheumatism.‡

Spinal meningitis causing paralysis has followed diphtheria, typhoid fever, small-pox, and occasionally scarlet fever.§ In two infants, aged respectively three and four weeks, the disease followed the injection of Morton's fluid for the cure of spina bifida.‖

Symptoms.—There is, in some cases, a sense of chilliness, followed by febrile disturbance and a quick pulse. Then ensue pains in the course of the spine, which may be limited to the cervical, dorsal or lumbar region, and increased on movement, or lightly tapping over the vertebral spines. Pains are also experienced round the body, muscular spasms, eventual loss of motion, and paralysis. This latter is owing to compression of the cord by the effusion, and is often combined with bed-sores. Sometimes the disease extends upwards along the spinal canal, and produces inflammation of the cerebral membranes, or involves the substance of the cord itself.

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* Jones and Sieveking, op. cit., p. 292.

† Ibid., p. 294.

‡ 'Steiner's 'Diseases of Children,' 1874, p. 66.

§ 'Brit. Med. Jour.,' vol. i, 1881, p. 51.

‖ 'St Bart. Hosp. Rep.,' vol. xv, p. 51.

I have recorded an interesting case in a girl, 12 years of age, who was admitted into the Samaritan Hospital under my care, November 18th, 1881. In jumping off a height, three months previously, she alighted on the lower part of the back and sacrum. She instantly experienced great pain over the seat of the accident, but with assistance managed to walk home, where she remained in bed for two days. She then resumed school, and two days afterwards felt so much pain that she was obliged to go to bed again, which she kept till admitted into hospital. At this time there was fulness and tenderness over the sacral region, and the spine was curved owing to the position she had assumed in bed. There was pain down both legs, and a sensation of pins and needles in them. The patient walked with her face looking on the ground, the shoulders and head were bent forward, and the nates prominently projected. The temperature was normal, the urine pale and alkaline, and the bowels were regular. There was no difficulty in micturition, or in defæcation. The case was one of chronic spinal meningitis with effusion. There was the possibility of Pott's disease of the spine coming on, or paralytic symptoms from the extension of inflammation to the substance of the cord. The treatment consisted in absolute rest in bed, and repeated small blisters to the spine in the lumbar region, reaching as high as the eighth dorsal vertebræ. A mixture of iodide of potassium, tincture of belladonna and bark, was given three times a day, and continued till February 10th, 1882. On the 3rd of March she could walk about the ward, and the sensation of pins and needles had departed. On the 19th she left the hospital, with instructions to lie on her back for three months, and this was strictly observed. In January, 1883, her parents informed me that she was quite well, and that her gait was unaffected.*

Pathology.—After death in these cases the dura-arachnoid is found thickened, the vessels are congested, and there is an effusion of serum and puriform lymph. When the arachnoid is likewise involved (*lepto meningitis*) the cord has an irregular appearance, owing to the effusion of lymph within the arachnoid space. Where the inflammation arises from disease of the vertebræ and other neighbouring structures, it appears localised in certain portions of the spine; but when owing to a general cause, it may spread throughout the length of the spine, it selects the posterior rather than the anterior surface. On cutting the arachnoid lymph is found beneath of a yellowish-green hue, toughish, or softer, or even puriform.*

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* The 'Lancet,' 1883, vol. i, p. 770.

Diagnosis.—If the attack be acute there is fever, pain in the back and limbs, increased by movement, muscular spasms, and later on retention of the fæces and urine. If the disease be complicated with meningitis at the base of the brain, there may be headache, vomiting, delirium, optic neuritis, loss of speech or convulsions. If the meningitis be purely spinal in its seat, and there are no cerebral symptoms, the probabilities are that it is not tubercular. Simple spinal meningitis is so like tubercular spinal meningitis that no difference can be drawn in their symptoms and pathology, but in the latter variety the base of the brain is similarly involved. The disease is not easy to distinguish from acute softening of the cord.

Prognosis.—This depends in a great measure on the situation and severity of the disease, and the question of its extension to the cerebral meninges. Acute spinal meningitis proves fatal in a large number of cases in a few weeks, complete recovery being rare. The more subacute cases sometimes get quite well, but relapses are common, and acute mischief is easily lighted up.

Treatment.—Rest and quietude are most essential. The patient should lie in a cool room, on his face or side, in preference to his back. The diet should be nutritious and unstimulating. Leeching over the seat of pain and mischief in the spinal cord, ice to the spine, and active aperients are necessary. Afterwards counter-irritation in the shape of flying blisters may be tried along each side of the spine. Opium or morphia are required if the pain is severe, and sometimes the latter should be used hypodermically. Hydrate of chloral, bromide of potassium and belladonna, are sometimes demanded. Small doses of bichloride of mercury, with iodide of potassium and bark, are useful to promote the absorption of inflammatory products.

Myelitis, or inflammation of the spinal cord, is a very rare disease; it generally follows an injury or pyæmia, or exposure to cold. Myelitis can be produced in rabbits by freezing the hind legs with ether spray, and according to Dr Althaus, the first effect of the irritation is to cause spasm and then paralysis of the blood-vessels by vaso-motor influence.* The inflammation may attack the whole or a portion of the cord, and hence the symptoms vary according to the seat of the disease. There is pain in the back, and if the mischief is in the cervical region, difficulty of breathing. The disease may be attended with inflammation of the brain owing to the extension of inflammation from the cord, and the sympathy existing between the brain and spinal system. With the advance of the disease, paralysis, sloughing of the skin, alkaline and albuminous urine, supervene. Death takes place sooner or later, and if life is prolonged, there is paralysis of motion and sensation in the parts below the seat of the disease. It often terminates in softening of the cord, but never produces pus, except from pyæmia.

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* Wilks and Moxon, op. cit., p. 245.

An interesting case of *acute softening of the spinal cord* is recorded of a female child, 11 years of age, who was admitted into the Bristol General Hospital with paraplegia, under the care of Dr Clark, December 31st, 1873. The disease began a week before admission with shivering and pains in her limbs, but she went about till three days previous to entering the hospital, when she suddenly lost the use of her legs. She never had convulsions, and there was no history of any injury to the back. There was pain along the vertebral column, which was worst in the cervical region. It was not increased on pressure, and she could move her head about freely. There was complete paralysis of motion of the lower extremities. Sensation was diminished in the right lower extremity, and there was no sensation in the left. There was complete loss of power over the bladder and rectum, urine acid, lithates, no albumen. Optic discs normal. The highest morning temperature was 99·4°; the highest evening 101°. The third day after admission there was partial paralysis of the upper extremities. On the fifth day there was more pain in the cervical region. On the sixth day the urine was alkaline, ammoniacal, and contained pus and albumen. On the seventh day the paralysis of the extremities had increased, difficult breathing and congestion of the lungs came on. On the tenth day difficulty of breathing increased, and death took place.

Post-mortem examination.—The cerebral veins were congested and there were several points of congestion in the brain, which was otherwise pale. "The spinal cord weighed ¾ oz.; the membranes were healthy; there was a quantity of serous fluid in the arachnoid sac; the cervical portion of the cord was firm, but on making a transverse section there were several points of injection in it; lungs congested; pleuritic adhesions on the right side. The heart weighed 4½ oz., and was healthy. Liver, spleen, and kidneys normal, but intensely congested. Stomach, intestines, uterus and ovaries normal. The bladder was in a state of acute suppurative inflammation; the coat was very much thickened, and the mucous membrane lining the interior was covered with a yellowish grey slough."[*]

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* 'Medical Society's Proceedings,' vol. iv, p. 76.

Treatment of myelitis.—The subcutaneous injection of ergotine, as in the inflammatory stage of infantile paralysis, is recommended by Dr Althaus,[†] and when inflammation has subsided, iodide of potassium to promote the absorption of any effused fluids and morbid products. Later on, cod-liver oil, phosphorus, friction, shampooing, and electricity will be found serviceable.

An interesting case of *elongated cavity in the spinal cord* (*Syringomyelus*) is recorded by Dr Frederick Taylor, of a female child, aged eighteen months, who was well till the age of five months, when it could not hold up its head, and from that time the head enlarged. On admission into the Evelina Hospital, Nov. 19th, 1877, the arms became completely paralysed. The head presented the characteristic signs of chronic hydrocephalus, and was very large. The anterior fontanelles and anterior sutures were widely open; the eyeballs prominent, optic discs white, and vessels of the usual size. Arms motionless and flaccid, legs distinctly rigid. The child got an attack of measles in November, and died of broncho-pneumonia on December 5th.

The post-mortem revealed pleuritic effusion on both sides, and lobular pneumonia at the base of the lungs. A pint and a half of fluid was obtained by a trochar through the anterior fontanelle; the ventricles were greatly distended, and the fourth ventricle was large enough to contain a small walnut. "The membranes of the spinal cord were healthy. The cervical and lumbar regions had their usual consistence; but the dorsal region was quite flaccid, and on making transverse sections it was seen that in this region the cord was hollowed by a considerable cavity. The largest cavity

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[*] "Acute Softening of Spinal Cord," 'Lancet,' vol. i, 1874, p. 442.

[†] See Chap. XLVII, "On Infantile Paralysis."

(for there were altogether three) was of irregular size and shape, and altogether extended from the lowest part of the cervical to the highest part of the lumbar region, and was two and a half inches in length."* These cavities did not correspond with the central canal of the cord. Dr Taylor quotes observations of other authors on this rare condition. This case is essentially, as far as clinical features show, an instance of hydrocephalus. No symptoms that were observed can guide us to the suspicion of a similar state of the cord in other patients; neither must we forget that in making post-mortem examinations of the brain, the cord is seldom examined, hence the presence of cavities may be more common than is supposed.

Cerebro-spinal meningitis, cerebro-spinal fever.—This formidable and fatal disease is of sufficient frequency and importance to be alluded to. Young persons are most liable to it, and children are not infrequently attacked. The disease has prevailed in the chief countries of the Continent, as well as in England, Ireland, and America.

It would seem to be entitled to rank among the specific diseases, for it often occurs as an epidemic; it has a fatality like typhus, which it resembles; it is due to blood-poisoning, and not infrequently there is a petechial rash.

The *causes* appear to be due to cold and exposure, fatigue, bad living and insanitary conditions, like typhus, but it is not contagious.

The *symptoms* usually begin with rigors, followed by fever, severe pain in the back of the head, extending along the spine, and stiffness of the cervical muscles. Nausea and vomiting are usually severe. In some cases described, the child falls into a state of stupor, moans or cries, and then becomes unconscious, with a dusky countenance, from which state it does not recover. In other cases the intellect remains clear. The head is thrown backwards towards the spine, and there is tetanic stiffness of the muscles, paralysis, and even convulsions. Disordered vision is not uncommon. The temperature runs up to 104,° or even higher in some cases; the pulse is quick and small; the tongue furred, the urine scanty, and sometimes albuminous. Petechial spots are seen over the face, neck, chest, and limbs, of variable size, and disappearing on pressure. Herpes on the lips is often noticed in connection with the disorder, particularly in mild cases. The disease may terminate fatally in a few hours, or it may last over a week.

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* 'Pathological Transactions,' vol. xxix, p. 21.

Spinal meningitis may be associated with tubercular cerebral meningitis; and it is possible that some cases of so-called "cerebro-spinal fever" in children depend upon tuberculosis, just as others may originate from traumatic causes.[*]

From a number of cases admitted into the Dundee Infirmary, in December, 1877 and 1878, Dr Maclagan regards the disease as contagious, and bearing a great resemblance to typhus. It sets in with rigors, intense headache, pains in the neck, limbs, and trunk. There is fever, and the respiration is quick and cerebral in character; the patient is restless; the tongue dry and furred; urine high coloured, deficient in chlorides, and sometimes contains albumen. The cuticle desquamates freely after cerebro-spinal fever. The writer says it is distinguished from typhus by more sickness at the onset and more headache, the intellect is often clear throughout the illness, and there is a less tendency to delirium.[†] The resemblance, however, appears to be very close. The morbid appearances found after death were inflammation of the membranes of the nervous centres, lymph, and fluid effusion into the arachnoid, and intense injection of the vessels of the pia mater. The veins in the spinal cavity were full, and there was vascularity of the membranes of the cord. One case terminated fatally in rupture of the spleen.[‡]

In a case recorded by Dr H. Vandyke Carter, of Bombay, the patient was semiconscious from the first. On the third day he became insensible, and died on the fifth day. At the post-mortem examination the meninges were greatly congested, and over the convexity of the hemispheres was a layer of greenish-yellow pus; the spinal subarachnoid space was occupied with puriform lymph like that in the brain, and the effusion was almost limited to the posterior surface of the cord.[§]

The favorable symptoms which precede recovery are a cessation of pain and fever, relaxation of the muscles of the neck, undisturbed sleep, and returning appetite.

The *diagnosis* is mainly grounded on the typhoid symptoms, the epidemic character of the disease, and the cerebral and spinal symptoms. The *prognosis* is extremely unfavorable.

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[*] "Cerebro-Spinal Meningitis," editorial, the 'Lancet,' 1876, vol. ii, p. 57.

[†] "Cerebro-Spinal Fever," the 'Lancet,' vol. i, 1878, p. 219.

[‡] Ibid., 1878, p. 822.

[§] "Note on the Occurrence of Cerebro-Spinal Meningitis,' 'Lancet,' vol. ii, 1878, p. 730.

The *morbid appearances* found after death are great congestion of the cerebral vessels, and effusion into the ventricles; coagulated blood in the sinuses of the dura mater, and an exudation of serum or pus among the meninges of the brain. Very similar appearances are presented in the membranes of the spinal cord. "But when the case is as usual of mitigated, yet fatal severity, you find it a pia-arachnitis, the lymph lying chiefly on the dorsal surface of the pia mater. Only in the very rarest cases do any products appear in the arachnoid space. The spinal cord itself in this disease is often quite free from change."* In the case of a girl, 13 years of age, admitted into the Hitchin Infirmary, the spinal cord in the lower cervical and upper dorsal vertebræ was softened, and about the consistency of cream.† There are also sometimes evidences of congestion and inflammation in the lungs, pleura, and pericardium, enlargement of the spleen, fatty degeneration of the liver and kidneys, and occasional enlargement of Peyer's patches.

Treatment.—Hitherto this has been most unsatisfactory, various methods having been tried, with small success. Leeches behind the ears, or cupping along the spine may be demanded in some cases. Cold applications to the head and spine have also been found serviceable. At the onset, where there is high fever and delirium, the head may be shaved, the ice-cap applied, and calomel given every four hours, The hypodermic injection of morphia to relieve pain, hydrate of chloral to procure sleep, and bromide of potassium to quiet the nervous system are severally indicated according to the peculiar circumstances of each case. If typhoid symptoms are present, quinine should be resorted to, and as a rule, enemata, nutritious food, and stimulants will be required.

Sexual precocity or aberration is found in some children. The subject is a very disagreeable one, but its consideration cannot be entirely omitted from a work of this kind. In boys the practice of masturbation may be caused by irritation produced by a long prepuce; in girls it is undoubtedly due in many cases to the irritation of ascarides, especially when they escape at night from the anal ring and wander into the vaginal orifice. The little girl is thus induced to scratch herself, and so in time the habit is gradually formed. In both, the practice may be communicated by other children who have acquired the vicious habit; at other times it is to be feared the practice is brought about by the improper conduct of nurses, and especially Indian *ayahs*. When a child is fretful, the irritation of its genitals distracts it, and the excitement so produced is followed by languor and sleep. Occasionally, in girls, it results from vaginitis, as a result of dirty habits and general neglect. In such cases, carelessness on the part of the mother is much to blame. Where clonic spasms and paralysis are the consequence of this habit in boys, to touch the meatus by a probe is usually followed by almost instantaneous erection of the penis, and by convulsive movements. The increasing development of the nervous system in both sexes, and the consequent tendency to precocity, makes one fear that this evil practice is becoming more common. If such is the case, it is highly incumbent upon parents and guardians to recognise the fact, and to give assiduous attention to the *morale* of their children and their associates.

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* Wilks and Moxon's 'Pathological Anatomy,' 1875, p. 246.

† 'Lancet,' vol. i, 1876, p. 814.

CHAPTER XLVII

INFANTILE PARALYSIS—ACUTE ANTERIOR POLIO-MYELITIS

CAUSES—*Exposure to damp and cold—Eruptive fevers—Blows or injuries to the hip—Chronic illness.*—SYMPTOMS—*Sudden or gradual loss of power in all or some of the muscles of one or several limbs—Debility and slight fever—No headache, sickness or convulsion except by pure coincidence—Paralysis, gradual or sudden, but at length complete—In some cases transitory.*—PATHOLOGY—*Diffuse acute inflammation of the anterior cornua of the spinal cord—Changes rather obscure than positive.*—DIAGNOSIS.—PROGNOSIS.—TREATMENT—*Rest in bed—Leeches to spine—purgatives—constant current—induced current—Subcutaneous injection of ergotine—Injection of strychnia—Belladonna—Ergot of rye—Iodide of potassium—Counter-irritation—Iron—Phosphorus—Strychnia—Cod-liver oil—Shampooing.*—DUCHENNE'S PARALYSIS—*Causes—Symptoms—Pathology—Treatment.*

NEURALGIA—*Rare in children—Causes—Treatment.*

THERE are four principal forms of paralysis in children:

1. Obstetrical paralysis.
2. Paralysis from brain disease.
3. Infantile paralysis properly so called.
4. Duchenne's paralysis.

1. *Obstetrical paralysis* sometimes occurs from pressure of one blade of the forceps on the portio dura at its exit from the stylo-mastoid foramen. During the operation of turning, from undue violence the brachial plexus may be torn or injured, and paralysis of the upper extremity is produced. If any undue impairment of the cerebral circulation takes place, there may be hæmorrhage of the corpus striatum, producing all the ordinary symptoms of cerebral hemiplegia.

2. *Paralysis from brain disease* may be the result of hydro-

cephalus, meningitis, apoplexy, and cerebral tumours. I once met with a case of hemiplegia, in a child nineteen months old, who had a subacute attack of meningitis and recovered. Paralysis is sometimes the result of rheumatism, typhoid fever, diphtheria, and especially scarlet fever. Disease of the petrous portion of the temporal bone may produce facial paralysis. Paralysis may occur during dentition, and be associated with convulsions and laryngismus stridulus.

3. *Infantile, or infantile spinal paralysis* (*acute anterior poliomyelitis*) is a disease occurring in young children, the nature of which has not been satisfactorily investigated. It is particularly apt to attack children under two years of age.* It may begin in the first few weeks of life and during dentition. It is a motor paralysis only, sensation being in no way affected. The limbs are not necessarily alone affected; the muscles of the back may be involved, and the spine more or less curved. It is generally the right lower extremity that is attacked.

Causes.—The disease may appear in children who have not been previously out of health, or who have not suffered from any nervous or febrile disorder. A child who came under my care with infantile paralysis in January, 1879, walked when he was a year old; he then partially lost the use of his left leg, whilst cutting a tooth. At two years old, when I first saw him, he could walk, but was lame, and the muscles of the affected limb were wasted. I have known the attacks follow cold, intestinal derangement, ulceration of the throat, diphtheria, and the eruptive fevers. In rickety subjects, with delayed dentition, a child may suddenly lose the use of a limb, and wasting and contraction continue until there is permanent deformity, such as club-foot, necessitating division of the tendons. A child, two years of age, had bronchitis followed in six weeks by measles. A fortnight later paralysis of the lower limbs came on. The disease may succeed convulsions in children, and irrecoverable paralysis may ensue.

Symptoms.—The disease creeps on insidiously in some cases, especially in excitable children, who come of nervous parents, but the symptoms often set in suddenly, the paralysis coming on in a few hours. A child may be playing about in his usual health, go to bed apparently in all respects well, and wake up next morning paralysed in one limb or more; most frequently in the lower extremities, so that on attempting to stand or support himself he falls. The paralysis, or inability to stand, is the only symptom in many cases. There is no pain whatever. A male child, four years of age, pale and delicate, came under my notice in September, 1875, with complete paraplegia. Two months before I saw him, he was playing on a lawn one evening in his usual health. Next morning he could not use his legs. The muscles of the calf became flabby and the joints relaxed; his appetite was excellent, and he had perfect control over the sphincters. The urine was healthy, the temperature normal, and there was no tenderness in any part of the spine. He was ordered friction with bay salt for the limbs, flannel clothing next the skin, and the syrup of the hypophosphite of iron twice daily, as he was weak and pale. A fortnight later, when his feet were allowed to touch the ground he could move one foot in advance of the other. He also crawled about the floor with greater ease than at first, and did not allow his legs to remain so long at rest. A month afterwards he moved his legs with still more freedom when supported, with his feet touching the ground, and he had more confidence in himself. The muscles of the calf in both legs were much less firm than those of the nates and thigh, which were in no degree wasted; the loins were well developed, and the patient sat up fairly well in a chair. The spine was nowhere prominent, nor was any tenderness felt on percussion. He could move the left leg with the greatest ease when sitting down, pulling it up rapidly under him, but he could do nothing with the right leg in the way of lifting it up like the other, though he felt the ground with it, and when the sole was touched with a pin, or tickled, he complained, but not the least reflex action was induced. The right foot was colder and more swollen than the left.

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* 'Clinical Lecture on Cases of Acute Atrophic Paralysis in Infants and Adults,'' by T. Buzzard, M.D., the 'Lancet,' 1880, vol. ii, p. 925.

In 1878 the child could walk when taking any person's hand, but the muscles were still wasted and weak, and he moved along timidly and insecurely. In 1884 his general health was excellent. He walked with the aid of a stick, but his movements were awkward.

In most cases there is febrile disturbance, which may last several days, with thirst, loss of appetite, headache, screaming, convulsions, and loss of consciousness. These symptoms may rapidly develop themselves after the paralysis has been established. In a few exceptional cases there is said to be no fever whatever at an early stage, and Duchenne is of this opinion; but it is generally present in some degree, although it may escape notice.

The arms may be alone affected, but more commonly the legs, sometimes one arm or one leg, or one arm and leg of the same side, or opposite sides. In very exceptional cases both arms and both legs are affected, but, as previously stated, the right leg is the most frequent seat of infantile paralysis. When the paralysis occurs in one arm, say the left, the patient will use the right hand to eat or drink, and make no use of the left whatever. The thumb and fingers may be widely separate, and the back of the hand when extended has a rather concave appearance. The hand drops at the wrist as if useless, the thumb is flexed inwards towards the palm, and the phalangeal articulations are loose. On attempting to take up anything the child will slide the object to the edge of the table before it can be grasped. If the leg of the same side is also affected, so as to constitute hemiplegia, or indeed if it be alone affected, the child, even with assistance, walks unsteadily, the limb being moved with less freedom than the sound one. He turns out his foot, the ankle-joint being bent inwards at the same time, so that he rests chiefly on the inner border of the foot. On looking upwards the patient is afraid to venture to walk; he requires to watch his foot at every step.

Considerable wasting in the muscles of the gluteal region and thigh may often be observed. In some cases it is chiefly noticeable in the gastrocnemius, and the muscles of the foot, especially the small interossei. The affected limb, from diminished size of the blood-vessels, generally feels much colder than its fellow, and is damp; the toes too present a bluish aspect, and there is a liability to chilblains. In the parts affected Dr Lockhart Clarke estimates the fall of temperature to be as much as five degrees.* The paralysis is attended with flaccid muscles, and signs of atrophy; the muscular tissue undergoes degeneration or absorption, so that in severe cases it almost entirely disappears, and leaves the skin in close contact with the bone. The ligaments are relaxed, and deformity of one or both feet is not uncommon. The patellar tendon reflex is absent in the affected limb. The extensors in infantile paralysis are more frequently affected than the flexors, and as a result of this the flexors become permanently contracted. Reflex excitability is soon abolished, and the muscles do not contract under the employment of faradization. "Many of the muscles paralysed lose their faradaic excitability entirely within a week, and rapidly waste. But although they fail to respond to the strongest induced currents they react to slow interruptions of the constant current (reaction of degeneration). The nerves to the muscles, on the other hand, lose their excitability to both forms of electrical excitation. Some, again, of the muscles whose faradaic excitability has been lowered, but not lost, are not long in regaining the power of contraction to voluntary impulses."* In mild cases, the use of the battery maintains the contractility of the muscular fibre till the fundamental cause of the disease is remedied, thus preventing the permanent and irremediable muscular atrophy. In this disease there is an absence of pain, and a freedom from irritation of the skin and bed-sores, a fact which distinguishes it strongly from other forms of paralysis.

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* Quain's 'Dictionary of Medicine,' 1883, p. 694.

The urine often contains excess of phosphates. These were present in two cases under my care at the same time.

A remarkable case recorded by Dr Andrew and Dr Dyce Duckworth, shows that a form of "all but universal paralysis" may occur in childhood from exposure to heat, and be followed by complete recovery. The patient was a little girl two and a half years old. There was almost complete loss of motor power in her arms and legs, and anæsthesia of the affected parts. The muscles were soft, wasted and flabby, and the urine and fæces passed involuntarily. The authors considered that the case differed from essential infantile paralysis in the affection of the sphincters, and the disturbance of sensation. They were of opinion that the symptoms were due to profound nervous exhaustion, affecting the spinal marrow as well as the muscles. Steel, cod-liver oil, and belladonna were prescribed. Faradization was practised daily. The child recovered in two months.†

Pathology.—Infantile paralysis is limited to the spinal cord. The brain and cranial nerves exhibit no morbid appearances. The disease is attributed by recent observers to inflammation (*acute myelitis*) of the anterior cornua of the *grey matter* of the spinal cord, whence the motor roots of the spinal nerves spring. The large cells become atrophied and at length disappear. According to Charcot, the disease begins in an inflammation of the ganglionic cells of the anterior cornua of the grey matter of the spinal cord, which gradually spreads to other parts. The recovery of the limb depends upon the recovery of these cells. It may affect any portion of the cord, cervical, lumbar or dorsal, but the latter is the most rarely involved.

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* Buzzard, op. cit., p. 925.

† 'Med. Chir. Trans.,' 1877, p. 273.

In cases that terminate fatally after a lapse of years, the anterior cornua are found wasted and the cells disintegrated, whilst the posterior cornua are healthy. The muscles are soft and atrophied, more or less replaced by fat, and the interstitial tissue is hypertrophied; the tendons are smaller, the bones shorter, and the medullary canal is enlarged.*

Diagnosis.—An acute attack is recognised by complete loss of motion, usually in one or both legs, without pain or disturbance of sensibility. The affected muscles atrophy after the lapse of a month or two, and more or less fail to contract under faradization, the limb is flaccid and cold, and the joints are relaxed. The face, bladder, and rectum are unaffected. Some degree of pyrexia is generally present at an early stage, though it may pass unnoticed. In paralysis of cerebral origin, strabismus, and facial paralysis may be looked for; the joints are stiff and contracted, and there is no atrophy of the muscles. In hæmorrhage into the cord, the sphincters are paralysed, and bedsores happen early.

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* Some interesting microscopical specimens of the spinal cord were exhibited before the Pathological Society (February 8th, 1879). The spinal cord in the *first* case was from a child, three years old, who had suffered from infantile paralysis since the age of fifteen months. There was a history of a blow on the hip, followed in three days by pain in the left leg, paralysis, and feverishness. Pain lasted ten days, and then paralysis remained. The child died of broncho-pneumonia. The muscles of the left leg were pale in colour, and soft and gelatinous in consistence. The lumbar portion of the cord was diminished in size on the left side, and the interior roots of the lumbar nerves were smaller. Microscopically there was almost complete absence of motor ganglion cells in the left anterior cornu; the substance forming the basis of the grey matter had lost its open spongy texture, and presented a uniform felt-like appearance. In the *second* case a child, two and a half years old, had a fall which did not appear to hurt it; thirteen days afterwards the *left* arm and leg became paralysed. Then both legs lost motion and sensation, both arms were powerless, but had not lost sensation. The evacuations were involuntary. The child took measles, and died of broncho-pneumonia nine weeks after the accident. The spinal cord was much diseased, and the grey matter was thick, and there were patches of red softening in the anterior cornua in the lumbar regions. Above the softened parts there were a large number of leucocytes in the perivascular spaces. There were no ganglion cells on the left side; exudation corpuscles, granular bodies, and free nuclei took their place. The posterior horns were diseased, but more on the right side than the left. The changes were most marked in the cervical portion of the cord, then in the lumbar, and less in the dorsal; there was distinct sclerosis in the antero-lateral columns of the cord, especially on the left side. In the *third* case the child, aged three and a half years, died of scarlet fever. At seventeen months old she fell ill with "relaxed bowels," and was unable to walk, which she had previously done. The power of walking soon returned to a limited extent. Weakness was especially noticeable in the left leg. The lumbar region of the spinal cord was found on section to be smaller on the left than on the right side, and it was most marked in the interior cornu; the posterior cornu were equal in size on the two sides. On the left side the ganglion cells of the anterior cornu had nearly disappeared; there was no sclerosis of the anterior horns or of the antero-lateral columns.

Prognosis.—Partial or complete recovery is the rule, when the case comes under treatment early. If the palsied muscles respond to the faradaic current recovery may be expected, but if no excitability whatever is produced in them at the end of two or three weeks by the induced and continuous current, then the paralysis is likely to prove permanent. Even if a small amount of contractility can be excited by the current, there is hope of the limb regaining its power. In some instances the growth of the limb is interfered with, and the child never afterwards has complete control over it.

Treatment.—Nothing can be done without the most absolute rest, and the patient should be placed on the side or face, rather than on the back. The fact that several authorities speak of very different remedies is conclusive that no specific has yet been discovered; which is not to be wondered at considering the obscure origin of the disease. In the early stages, if there are febrile symptoms, saline aperients and cooling medicines are necessary. Two or three leeches to the spine, and counter-irritation may be serviceable. When febrile symptoms have departed, we must endeavour to restore the power of the paralysed muscles.

Dr Buzzard recommends the following method of treatment from the first hour of attack: "The patient should be kept absolutely at rest in bed, a light diet administered, counter-irritation in some form applied to the neighbourhood of the spinal column, and the bowels emptied by a mercurial, followed by a saline purgative. At the same time it would be well to give the liquid extract of ergot in full doses, at intervals of an hour or two at first, and gradually less frequently, the administration of this drug not being continued beyond a week. At the end of eight or ten days the faradaic reaction of the muscles should be carefully tested and recorded, but induced currents should only be applied for the purpose of testing. For treatment I should apply a continuous current of from 5-10 cells from the nape of the neck to the bottom of the spine for five minutes daily, taking care to increase the strength of the current from zero upwards gradually, and at the end of the application to lower it to zero before removing the rheophores, so as to avoid shock. The constant current might be applied in this way for three weeks at a time, then omitted for a week and reapplied as before for three or four weeks."[*][†]

Some authorities consider that the use of faradization is objectionable, the induced current stimulating the cutaneous nerves, and impulses so started are conveyed by the posterior roots to the grey matter of the cord, and thence to the large ganglionic cells in the anterior horn. As these cells are in an inflamed state, they are of opinion that the irritation is apt to be increased by faradaism, and positively mischievous in some cases.[‡] It seems to me that treatment by the continuous current may maintain the functional activity, and with it the nutrition of the muscles, until the disease is cured. When it is employed early, before degeneration or atrophy has set in, the disease may be arrested and the deformity removed. Recovery, however, sometimes takes place without any electrical treatment whatever to the affected muscles.

It is important to commence with a weak current so as to excite a small amount of muscular contraction, for fear of causing alarm, and gradually to increase the strength of the current as the child becomes accustomed to it.

Dr Althaus, holding the theory that the disease commences in inflammation of the anterior cornua, strongly recommends the subcutaneous injection of ergotine. He proceeds on the principle that this alkaloid contracts the minute blood-vessels of the spinal cord, and controls the hyperæmia. A quarter of a grain of a solution of Bonjean's ergotine in distilled water for a child from one to two years of age, and half a grain from five to ten years of age, is the strength of the injection recommended, and it is to be repeated daily, or twice a day according to the symptoms. If the thermometer runs up to 103° or 104° the remedy is to be used more freely than when there is only a rise of one or two degrees. The use of the ergotine reduces the fever, and is an antiphlogistic remedy. It should be employed till the temperature is normal.[§]

I have had no experience of the subcutaneous injection of strychnia, recommended by Mr Barwell, and used in many cases with advantage by Dr Lockhart Clarke (Quain, op. cit., p. 695).

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[*] 'Diseases of the Nervous System," 1882, p. 86.

[†] Errors are apt to arise in reference to the terms *interrupted* and *constant* currents. By interrupted is meant the faradaic or induced current. By constant is understood the continuous, uninterrupted or galvanic current. There is little or no shock felt with the constant current; whereas with the induced there is sensation enough to alarm the child at first, and to make it dread the operation till it gets accustomed to it.

[‡] Buzzard, op. cit., p. 86.

[§] 'On Infantile Paralysis,' 1878, p. 52.

Belladonna is useful by controlling a hyperæmic condition of the cord, and its membranes. Brown-Séquard says it diminishes the amount of blood in the vertebral canal, and produces a relative diminution of the vital properties of the vital cord and its nerves.* Ergot of rye has a similar action.

When the incipient or inflammatory condition is reduced, small doses of iodide of potassium in combination with bark are serviceable, and the remedy should have a fair trial. It checks inflammatory effusion, and lessens the growth of connective tissue.

Counter-irritation already spoken of is sometimes of great service. A blister may be applied to the nape of the neck, if the shoulder or arm be affected, and to the lower dorsal and upper lumbar vertebræ if the paralysis affects the lower limbs.

After this form of paralysis has lasted some time and the muscles have recovered their tone and strength, the patient may be unable to exercise the will, so as to bring the hand, or the legs, properly into use. This complication must be overcome by careful drilling, and the child should be encouraged to use the limb, and practise various movements.† Infantile paralysis is a very chronic and tedious disorder, and in some instances the treatment has to be persevered with for months or even years. Muscles which seem almost hopelessly wasted and paralysed, sometimes completely recover their size and form under a steady continuance of local and constitutional measures.

The use of iron, phosphorus, strychnia, and cod-liver oil, where there is general anæmia, and an absence of congestion and spinal irritation, ought to be steadily continued for weeks or months together. It is an excellent plan to immerse the affected limb in hot water for ten or fifteen minutes daily, before shampooing is commenced, and both night and day to maintain the warmth of the affected muscles by a stocking of "pure spun silk" or "chamois leather," as recommended by Dr Tibbits. Cold affusion and friction of the limbs are useful in restoring the tone of the wasted muscles. Mountain air, or a sea-side residence, is advisable in some cases.

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* 'Paralysis of the Lower Extremities,' 1861, p. 111.

† 'A Handbook of Medical and Surgical Electricity,' by Herbert Tibbits, M.D., 1877, p. 161.

The deformities that result from infantile paralysis will require surgical treatment.

Duchenne's paralysis (*pseudo-hypertrophic muscular paralysis*).—This disease is now well known to the student of medical literature, from the researches of the late Dr Duchenne, of Boulogne, whose name is, at least at the present time, always associated with it. Since that physician and later observers turned the attention of the profession to the complaint, it has been found to be less rare than was at first supposed. Butlin had the opportunity of making observations on four cases, all under treatment within the same year at the Children's Hospital, Ormond Street. The disease is most frequent among boys. Of twenty-three cases mentioned by Dr Gowers, eighteen occurred in boys.

It is a rare form of paralysis accompanied by enlargement or hypertrophy of certain muscles. It may occur in children who are born healthy and vigorous, and who have passed through the period of dentition well. The majority of cases begin about the sixth year, and death occurs between 14 and 18. The rich are more prone to suffer than the poor. It would also seem to come on after any severe illness, as measles. The disease is slow and chronic, and unattended by fever. No definite cause has ever been assigned, but authorities generally agree that it is most frequent in dull and idiotic children. Six cases are mentioned as having occurred in the same family, and in another instance eight brothers died of the disease.*

Symptoms.—These are, first those of weakness in the lower limbs, and finally loss of reflex excitability. If the child is old enough to walk, he moves along with a shuffling gait, placing his feet timidly and cautiously on the ground. He sways his body from side to side, and swings his arms at every step he takes. The belly is prominent or arched forward, the shoulders are thrown back, and there is a curve along the spine (lordosis). He is apt to tumble down if he meets with any impediment in his way, and cannot get up again without assistance. He stands with his feet apart to balance himself, with the toes everted. In attempting to rise from the ground the movements are very peculiar; the patient bends one knee, first placing his hands on it or some object near by for support, he then bends the other knee into the kneeling position, and so grasping his thighs from below upwards, gradually raises his shoulders and body to an upright position, proceeding in a very cautious and gradual manner, as if in fear of falling. This peculiar action has been considered pathognomonic. "Attention was called to it by Duchenne, and I have never seen it absent in a case so long as the patient possessed the necessary muscular power. I have never seen it in any other disease, and every doubtful case in which it was present ultimately proved to be an example of the affection. Its diagnostic importance is thus very great."*

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* 'Pseudo-hypertrophic Paralysis,' by W. R. Gowers, M.D., 1879, p. 8.

The disease first shows itself by the child being quite unable to walk when old enough to begin to do so, or if it has reached the age at which it can stand by itself, or walk, or run, it becomes very weak on its legs. This weakness continues for many months, progressing slowly, when the careful medical attendant, on examining the patient stripped, will at once recognise the disease if he finds that, after months of muscular weakness, the muscles of the leg have become larger and not smaller. In a few more months the hypertrophy extends to the buttocks, or even to the loins, the weakness increasing rapidly. The great firmness of the affected muscles when set into action would puzzle the uninitiated as it resembles what is seen in muscles hypertrophied by healthy exercise.

This hypertrophic stage lasts several years, and is followed by gradual and complete paralysis, the unaffected muscles lose motor power; those involved in the characteristic enlargement all diminish in size. The patient, now perhaps grown out of childhood, ultimately dies through falling a prey to some visceral affection, as is the case with most patients attacked by the other rarer and slower forms of paralysis.

Pathology.—In this peculiar form of paralysis, the muscles of the calf of the leg become enlarged and overgrown, and present a remarkable contrast to the muscles of the thigh and other parts of the body. In one case the gastrocnemii were abnormally firm when at rest, and during contraction, hard and knotted as the biceps of a blacksmith.† Dr Gowers found that on cutting into the gastrocnemius in one instance, it presented the appearance of a fatty tumour. It was a mass of greasy fat without any muscular redness.‡ The microscope reveals a degeneration of the muscular fibres, both in size and number, and a great overgrowth of the connective tissue between the bundles of fibres; fat is also deposited freely over the affected part of the muscle, but the fibrous hyperplasia is the primary morbid change.

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* Ibid., p. 4.

† 'Med.-Chir. Trans.,' 1877, p. 21, "Pseudo-hypertrophic Paralysis," by W. M. Ord, M D.

‡ Op. cit., p. 40.

In one case, related by Dr Ord, there was increased temperature in the affected legs, compared with the thighs, of from 1·8° to 3·9°.[*] In another case, also described by him, the thighs were warmer than the calves.[†]

Prognosis.—This is extremely grave. The patient may possibly recover if the disease should become stationary, but it generally extends upwards, and the functions of deglutition and respiration becoming involved, death takes place from exhaustion or asphyxia. The fatal result is not due to the disease itself, but, according to Dr Gowers, to some intercurrent malady. "The weakness and wasting of the thoracic muscles, for instance, gradually lessen the respiratory power. The patient is thereby weakened, and is rendered an easy prey for the maladies which lie in wait for the infirm. The most common cause of death, indeed, is the direct interference with the action of the lungs. As the patient becomes weaker, bronchial râles are heard through the chest, dyspnœa comes on, and is rather increased than lessened by the patient's feeble attempts to cough. Pyrexia may be developed, and the patient dies with the signs of a chronic broncho-pneumonia, which has in many cases been found after death."[‡]

Treatment.—This is in the highest degree unsatisfactory, and must be chiefly symptomatic or palliative during the later stages. When the disease has lasted only a short time, it may sometimes be retarded or arrested by friction, galvanism, and muscular exercises. Arsenic and phosphorus are among the best remedial agents; cod-liver oil is preferable to either.

Neuralgia is rare in children, but the practitioner should be aware of its occasional occurrence. I have already spoken of facial neuralgia in young children, apparently independent of gastric disturbance. I am assured by the mother of a child, four years of age, that it suffered from paroxysms of severe pain in the right leg and heel, which medical men thought was neuralgic. Neuralgia sometimes attacks the intercostal nerves, producing pleurodynia, or the brachial plexus, causing brachial neuralgia. Attacks of pain over the cardiac region in delicate children are often of neuralgic origin.

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[*] 'Med.-Chir. Trans.,' 1874, p. 16.

[†] Ibid., 1877, p. 19.

[‡] Gowers, op. cit., p. 40.

CHAPTER XLVIII

RHEUMATISM

Definition—Symptoms—Occasional high temperature—Pericarditis—Pleurisy—Subcutaneous nodules—Causes—Pathology—Prognosis and consequences.—TREATMENT—*Importance of rest—Aperients in the early stages—Sedatives to relieve pain—Alkalies, when to be employed—Salicin and its compounds—Their action in reducing temperature and shortening the seizure—Efficacy of the cold bath in hyperpyrexia—Lotions—Small blisters to the joints—Bark—Preparations of iron—Cod-liver oil and warm clothing in the convalescent stage.*

Rheumatic gout—Gout—Intermittent fever.

ACUTE rheumatism is a most painful disease which attacks the larger and smaller joints, but especially the former; it is accompanied with fever, and is prone to involve the fibro-serous structures of the heart and pericardium. It is essentially a disease of the joints, and of the heart, the structure of the cardiac lining membranes being, as Mr Hilton points out, like that of a joint,—fibro-serous. Rheumatism is not so frequent in childhood as in youth and adult life. It is rare under five years of age,[*] and is more common in girls than in boys. The youngest child I have seen with rheumatic fever was nearly six years old. Vogel has met with a case in a child one year and nine months old, who succumbed to disease of the heart after three months.[†] It resembles the acute rheumatism of adults, but it is less severe and protracted. The joint affection is not so acute, there is little sweating, and the perspiration is not so sour-smelling.

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[*] "Of the ages of patients affected with acute rheumatism, out of 159 cases admitted into the London Hospital, two were between 5—10, nineteen between 10—15, seventy-seven between 15—25, forty-three between 25—35, twelve between 35—45, and six between 45—55."—'Report of the Medical Registrar for 1876,' by G. E. Herman, M.R.C.P.

[†] Op. cit., p. 232.

Symptoms.—These begin not unlike a common cold, with pain in the back and limbs, followed by shivering, feverishness, and sometimes vomiting. After the lapse of a day or two, or it may be a week, one or more of the larger joints become swollen and painful, the surface is hot and inflamed, and the least movement will aggravate the suffering. The little patient lies motionless on his back with his arms extended by the side, and he looks alarmed as the practitioner proceeds to examine his limbs. The pain in some cases is most erratic. It may begin in the side, and in a few days attack the knees, ankles, shoulders, or fingers; one day it may be confined to the feet or knees, and the next day it may seize nearly all the joints, lingering for an uncertain time in one or more. The ankles and feet are first attacked as a rule, and the complaint is more prone to seize upon the wrists than the elbows and shoulders. There is loss of appetite and thirst; the pulse is full and soft; at times hard and bounding, from 100 to 120; the tongue is coated with a thick fur, or dry; the skin is moist, the bowels are usually costive, and the motions dark and offensive. The neck on one side is quite stiff in some cases (*rheumatic torticollis*), from spasm of the cervical muscles, so that the child cannot elevate his head to swallow food, the slightest movement increasing the pain. Inspiration is painful if the pectoral muscles are affected. Sleep is invariably broken and rendered impossible if there be much pain. When delirium occurs in the course of the fever, which is rare, it is the consequence of exhaustion.

The *urine* is high coloured, intensely acid, and scanty. On standing in a deep vessel for a short time it often throws down a copious deposit of urate of ammonia. The chlorides are deficient. Albumen is occasionally present, and this arises from congestion and renal irritation, due to the rheumatic poison, just in the same way as it occurs in the exanthemata, and such febrile diseases as bronchitis and pneumonia. The high specific gravity is a proof of temporary congestion, caused by the increased work thrown upon the kidneys. There is an excess of urea, but not of lactic acid.

The *temperature* varies considerably and depends to a great extent on the pain, and the mildness or severity of the local symptoms. In ordinary cases the temperature does not exceed 101° throughout the illness; it is often as high as 102° when the patient is first attacked, but it may reach 104° or more at an early period of the complaint in severe and dangerous cases.

Dr H. Weber has recorded an interesting case, in a lad, 16 years of age, where the temperature reached 108·2°, with delirium and other brain symptoms. The patient recovered under cold baths and cold affusion.[*] Hyperpyrexia, however, is not common in children.[†]

In many cases the heart becomes involved during the progress of the articular inflammation, and the younger the patient the more likely is this to occur. Pain in the chest and hurried breathing are indications of the heart being affected, but they may be absent and pericarditis and endocarditis steal on notwithstanding. Dr Sansom states that of 32 cases of acute and subacute rheumatism occurring to children under twelve years of age, admitted into the North-Eastern Hospital during the past three years, twenty, or sixty-two per cent. presented signs of endocardial affection.[‡] The symptoms which indicate this serious complication are not always obvious.

The cardiac affection seldom happens before the third or fourth day. It may steal on imperceptibly, and be overlooked till the joint affection subsides, and the pain abates. A moderate degree of febrile disturbance, and a slight affection of the joints, afford no guarantee that the heart will not become implicated in the course of the rheumatic affection ; indeed, it may be the first organ seized upon in young subjects, before there is any pain or swelling in the joints. So much is this the case, that the heart affection may be the first symptom to raise suspicion of the nature of the malady, and it is, therefore, wise in all cases of obscure febrile attacks in young children, to auscultate the heart carefully and frequently lest the disease be overlooked. Pericarditis, pleuro-pneumonia, or acute pleurisy, may be the first symptoms of acute rheumatism, the joint affection being developed later on or not at all. But, as a rule, if endocarditis or pericarditis is about to happen, there will be restlessness, or even convulsions, dyspnœa, pain in the cardiac region, oppression, and inability to lie on the left side.[§] In other cases, bronchitis, pneumonia, or pleurisy supervene, and even inflammation of the brain, but the latter is very rare.

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[*] 'Clin. Trans.,' 1872, p. 136.

[†] The report of the Committee on Hyperpyrexia showed that none of the hyperpyrexial cases were under the age of ten years, and only 1·8 per cent. of the 1300 rheumatic cases. Further it was ascertained that cases of hyperpyrexia are most common in the summer and least in the winter months ; that complications are not necessarily associated with this high temperature, but when hyperpyrexia is complicated by manifest lesions, there is a predominance of pericarditis and an excess above the average of pleurisy, pneumonia, and albuminuria.—'Clin. Trans.,' vol. xv, pp. 264—266.

[‡] 'Lettsomian Lectures,' 1883.

[§] See Chap. XL, p. 505.

The beginning of improvement is uncertain. It may commence in a few days after the disease has begun, but it may be delayed, and the disease last from a month to six weeks. The symptoms that indicate the decline of the disorder are an abatement of the pain, calm sleep at night, and a free and copious discharge of urine, which throws down a deposit of lithates.

Relapses sometimes happen; a child having had the disease once may have it again. A boy, 8 years of age, was admitted on five separate occasions into the Samaritan Hospital with acute articular rheumatism, and an aggravation of mitral mischief consequent on the first attack.

Small *subcutaneous* nodules are sometimes seen about the joints, especially the malleoli, the back of the elbow, and the margins of the patellæ. They are also met with on the pinna of the ear, the temporal ridge, the spine of the scapula, the extensor tendons of the foot and hand, the spinous processes of the vertebræ, and the cresta ilii. In structure they are made up of loose fibrous bundles, varying in size from that of a mustard seed to that of a bitter almond. They are free from redness, pain and tenderness and are very vascular. They never become bony. They appear in crops, and last from a few days to four or five months. In all the cases recorded by Dr T. Barlow and Dr F. Warner, heart disease was believed to be present.*

Causes.—These are *predisposing* and *exciting*. Among the first, inheritance can be traced in 27 per cent. of all cases.† The rheumatic diathesis is very marked in some families. "Of 12 children of a mother who had suffered from acute rheumatism and heart complication, 11 had the disease before they were twenty years of age."‡ This is probably as remarkable a record as could be found in the history of the disease.

The *exciting* causes are cold and wet in delicate constitutions, especially if there is insufficient clothing. It is most prevalent in the winter months, and a previous attack renders a child susceptible to a return. Acute rheumatism sometimes follows scarlatina, but much of the rheumatism that occurs, during or after scarlatina, is considered to be only muscular. Tonsillitis frequently precedes the disease.* Chorea may precede or follow rheumatism.

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* 'International Medical Congress,' Abstract, 1881, p. 415.

† Quain, op. cit., p. 1354.

‡ Steiner's 'Diseases of Children,' 1874, p. 336.

Pathology.—This is obscure, and none of the theories advanced throw much light upon the subject. 1. The *lactic acid* theory, where there is an excess of lactic acid in the blood. Dr Balthazer Foster has recorded several cases where the symptoms of acute rheumatism appeared after the exhibition of lactic acid, given for the treatment of diabetes.† 2. *Disturbance of the nervous system* from chill, causing the retention of lactic acid in the blood. 3. The *Malarial theory* where the rheumatism arises from the presence in the system of a poison partaking of the nature of a miasm, allied to, but distinct from, the miasm of malarial fever, according to Dr Maclagan.

Prognosis and consequences.—If the disease is confined to the joints, and the urine throws down a copious lateritious sediment, with an abundance of uric acid, the case is favorable; but if the articular inflammation suddenly becomes less, and inflammation is lighted up in the heart or brain, then the prognosis is less favorable. The disease rarely terminates fatally, if uncomplicated, but is apt to lead to valvular disease of the heart (especially mitral regurgitation), to be followed by a chronic form of the complaint. A clot may form in the right ventricle of the heart, or pulmonary artery, and lead to sudden death. As relapses may occur in the rheumatic fever of children, the treatment should not be abandoned too soon. Injudicious feeding, and especially over-indulgence in animal food, frequently invite a return.

Treatment.—The earlier the patient comes under treatment, the shorter is the probable duration of the complaint. The most absolute rest should be maintained, for any movement not only causes suffering, but relapse is less likely to ensue when patients remain long enough in bed. No remedy can bear any comparison to rest. The patient should be kept between the blankets, and the affected joints wrapped in cotton wool. The next point is to encourage a free action of the skin, kidneys, and bowels. For this purpose a dose of calomel, followed by an aperient mixture (Form. 8—41), or compound liquorice powder will be necessary. So long as there is high sthenic action, the bowels must be kept open. If there are pink lithates in the urine, a copious supply of potash is needed. If there is severe pain, opium, or some preparation of it, as Dover's powder, ought to be given; either alone, or with alkalies in large doses.[*] For the relief of thirst, barley water flavoured with lemon, seltzer water, toast and water, or plain water are indicated. The diet should be a fluid one, consisting of milk, light broths, and arrowroot. If the pulse is at all unsteady and the skin freely sweating, stimulants may be needed.

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* 'Collective Investigation Record,' July, 1888, p. 123.

† 'Brit. Med. Journ.,' December 23rd, 1871.

When the urine is alkaline, the heart is generally safe. The late Dr Fuller never had a patient attacked with peri- or endo-carditis after the urine had become alkaline.[†] This may be effected in the space of twenty-four hours, if large doses are given at intervals of three hours during that time. Alkalies appear to possess the power of maintaining the fluidity of the blood, and so preventing the deposition of fibrin on the valves of the heart, whilst they tend at the same time to purify the blood by increasing the action of the kidneys. If pushed to any great extent they favour the occurrence of anæmia. According to Dr Richardson, carbonate of ammonia possesses the power of maintaining a fluid condition of the blood, and although it has not the same influence over the rheumatic affection as potash, it may sometimes be combined with it advantageously when there is depression.[‡] Antimony acts in a similar manner, and likewise controls the force of the circulation. Aconite is also serviceable, and may be given with salicylate of soda. When the rheumatic inflammation does not yield to the alkaline method the periosteum and perichondrium are probably affected. If after five or six days the patient is no better iodide of potassium should be added to the potash, and continued during the convalescence.[§]

During the last few years the introduction of salicin and its compounds into practice has found some warm advocates. These preparations possess the power of reducing the high temperature of acute rheumatism, and the pyrexia of some other diseases. Salicin, salicylic acid, and salicylate of soda, have a very decided effect in shortening the duration of the pain and fever, and in reducing the per centage of heart disease; but of all the three remedies employed, the last is perhaps the best.[*]

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[*] Form 85 :

℞ Pulv. Ipecac. co. gr. iij.—M. To be taken in a little water-arrowroot and repeated when necessary.

Form. 86 :

℞ Potass. Bicarb. ʒij
— Nitrat ℈ij
Tinct. Opii ♏xvj
Syr. Limonum ʒss
Aquam ad ℥iv.

M. A dessert-spoonful every three or four hours.

For a child six years of age.

[†] "On Gout, Rheumatism, Rheumatic Gout, and Sciatica," 'Lancet,' vol. ii, 1862.

[‡] 'On Fibrinous Deposition in the Heart,' 1862, p. 40.

[§] "On the Treatment of Acute Rheumatism," by T. K. Chambers, M.D., 'Lancet,' vol. ii, p. 200, 1862.

Salicin was first introduced by Dr Maclagan, of Dundee. He recommends that it be given in large doses, till the pain abates. Dr Greenhow considers that salicin and salicylate of soda do not prevent complications arising in the course of rheumatic fever, which are equally frequent during this treatment; the patient is neither better nor worse, nor is he disabled for a longer or shorter time after it. Anæmia, and occasionally albuminuria, follow the salicylate of soda treatment, and health and strength are slowly regained. The pain and distress of the patients are lessened by both these agents, but the duration of the illness is not shortened. Dr Greenhow expresses his conviction that the weakening of the first sound of the heart indicates an influence upon the muscular structure of that organ.[†]

In the selection of salicin, salicylic acid and its salts, some difference of opinion prevails amongst medical men, as to which is the best of these remedies. Salicin is more soluble than salicylic acid, it is less likely to cause sickness, and is not so unpleasant to the palate; it may be given with a little syrup and aromatic water.[‡] Salicylic acid may be combined with the liquor ammoniæ acetatis,[§] or the bicarbonate of potash.[‖] Salicylate of soda may be given in plain water, with a little simple syrup.[¶] It is now generally admitted that the last is the best form of administration, owing to its solubility, and the rapid manner in which it is absorbed. The best plan is to thoroughly saturate the patient with the remedy at the commencement, and then to gradually diminish the dose and lengthen the interval after a distinct result has been produced. Relapses are best avoided by continuing the drug in small doses during convalescence, in just sufficient quantity to cause the urine to give a violet tint with perchloride of iron.[*] The presence of albumen, in the urine does not contraindicate the exhibition of salicylate of soda.[†] In five cases of acute rheumatism with albuminuria, the albumen disappeared in each case while the drug was being administered.[‡] Nervous symptoms, in the form of headache, deafness, singing in the ears and occasional delirium, as well as nausea and vomiting, have been observed to follow the use of these remedies. It is also worthy of special notice that their exhibition does not prevent the occurrence of heart complication, and that the liability to relapse is considerable. After a week or so, the salicylate of soda may be given with quinine.

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[*] Of 89 cases of acute rheumatism treated by salicin and its compounds in the London Hospital in 1876 the average stay in the hospital was 36·1 days, and those treated otherwise 41·8 days. The symptoms yielded sooner under the first mode of treatment; the duration of the pain and pyrexia was shorter, and there was a less liability to heart disease. Relapses, however, were rather more common.

[†] 'Clin. Soc.,' vol. xiii, pp. 244—262.

[‡] Form. 87:
℞ Salicin ℈ij
Syr. Aurant. ℥ss
Aquam Cinnamomi ad ℥iv.
M. A dessert-spoonful to be taken every four hours.

[§] Form. 88:
℞ Liq. Amm. Acet. ℥ss.
Acid. Salicylic. ℈ij
Syr. Aurant. ʒiij
Aquam ad ℥iv.
M. A dessert-spoonful every four hours.

[‖] Form. 89:
℞ Potass. Bicarb.
Acid. Salicylic. āā ℈ij
Syrupi ʒiij
Aquam Anethi ad ℥iv.
M. A dessert-spoonful every four hours.

[¶] Form. 90:
℞ Sodæ Salicylat. ʒj
Syrupi ʒiij
Aquam ad ℥iv.
M. A dessert-spoonful every four hours.

These prescriptions are for children six years of age.

The discussion at the Medical Society of London,[§] resulted in the general opinion that the salicylates alleviated the fever and joint affection better than any other treatment; but on the question of relapse and heart complications the opinions differed widely, so much so, that some members expressed the view that a renewed rise of temperature and accession of joint pains are more frequent under this method of treatment than the old.

When pericarditis supervenes in the course of rheumatism, and acute pain is referred to the cardiac region, no time should be lost in applying three or four leeches, if the patient has a hard pulse, and is strong enough to bear depletion. Heaviness of manner, heat of skin, and any degree of pulmonary congestion, with a dry cough and quick breathing, are among the indications for their employment. Moreover, the pain in the chest alone sufficiently justifies the practice, for its continuance further excites the action of the heart, and aggravates the serous inflammation already begun, by accelerating the circulation, and permitting that extra motion to the walls and valves of the heart which, in the progress of pericarditis or endocarditis are so much in need of rest. Generally a mustard poultice, or repeated linseed poultices, will supply the place of leeches; still they are sometimes useful in the cases I have pointed out. Opium, or hydrate of chloral, must be resorted to whilst pain and sleeplessness are leading symptoms. Opium, especially, soothes the nervous system, controls the hurried circulation, and reduces the frequency of the pulse. When the heart affection is severe, the joints may be scarcely if at all affected.

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[*] "Rheumatism treated by Salicylate of Soda," 'St George's Hosp. Reports,' 1874-6, p. 199.

[†] 'St Thomas's Hosp. Reports,' 1877, p. 81.

[‡] Ibid., 1878, p. 402.

[§] December, 1881, and January, 1882.

In those rare cases where the temperature suddenly rises very high, and death threatens from delirium and exhaustion, no remedy is so likely to save life as the cold bath.

Local applications are of great value in relieving pain. The affected joints should be swathed in cotton wool, and then covered with oil silk, a plan which conduces to the repose of the parts and to the comfort of the patient. A piece of linen rag saturated in a solution of bicarbonate of potash and laudanum may be had recourse to if the pain is severe and the joint hot. The solution must be warm, and cotton wool afterwards applied to the joint.

The plan of blistering the joints, as recommended by Dr Herbert Davies, is an excellent one, and, speaking from my own experience, I should say that nothing relieves the pain more effectually than the application of strong blistering fluid to the affected part. After the application the joint should be protected with cotton wool as just described. The discomfort caused by the blistering soon passes off.

As soon as the more acute symptoms begin to subside, bark should be given, and if the urine is still high coloured, potash should be added to it.[*] When the alkaline treatment is changed for the tonic, the ammonio-citrate of iron with the bicarbonate of potash is very useful,[†] and later on the syrup of the iodide of iron may be substituted with advantage. Cod-liver oil, too, is a valuable remedy to children of a strumous diathesis.

Too much care cannot be exercised in restricting the use of animal food, for fear of increasing the lactic acid in the blood, and either fostering the disorder, or bringing on a relapse, as I have already noticed; hence the propriety of giving suitable food sparingly, and of a non-nitrogenous character. Dr James Andrew has written an interesting paper on the subject.[*] An abundance of milk, together with vegetable and farinaceous food, such as gruel, arrowroot, rice and tapioca pudding, are the safest kinds of nourishment till every relic of the disorder has disappeared. When the complaint has vanished, white fish, chicken, sweatbread, &c., should be taken in preference to the stronger forms of animal food.

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[*] Form 91:
℞ Potass. Bicarb. ʒj
Tinct. Cinch. co. ʒij
Syr. Zingib. ʒiij
Aquam ad ℥iv
M. A dessert-spoonful three times a day.

[†] Form. 92:
℞ Potass. Bicarb. ʒj
Ferri et Amm. Citr. gr. xx
Syr. Aurant. ʒiij
Aquam Cinnamomi ad ℥iv.
M. A dessert-spoonful three times a day.

For children from eight to ten years of age.

The whole question of rheumatic fever is beset with difficulties, owing to the opposite opinions that prevail as regards the best mode of treating it, and the complications that may spring up in its course. It behoves us to provide against the latter difficulty by attacking the inflammation of internal organs vigorously, and without loss of time, by subduing pain and therefore preventing exhaustion, and above all to enforce such rules of living as shall modify that state of constitution favorable to the development of lactic acid in the blood, which favours the disease, promotes its relapse, and encourages its continuance.

We may repeat that it is well to make the alkaline and chalybeate treatment overlap. Thus the bicarbonate of potash may be continued some time after the acute symptoms have passed away, combining it with the ammonio-citrate of iron.

During convalescence we cannot overestimate the importance of maintaining the warmth of the patient by flannel clothing, and by guarding against cold, and over-excitement and fatigue of all kinds.

Rheumatic gout sometimes occurs in children, but it is very uncommon. The feet and hands are the parts usually affected, but chiefly the latter, the middle joints of the fingers being stiff, swollen, and painful, so that they cannot be closed completely, if at all.

Gout.—Although gout does not occur, as a rule, before the age of puberty, it has been met with in young children. "Sir C. Scudamore was assured by a gentleman whose mother laboured under this malady, that he was attacked in the great toe at eight years of age, and medical friends have informed me of cases having occurred at a still earlier period of life. For my own part I confess I have not seen a case of true gout, that is, an articular affection implicating the great toe, in patients much under the age of twenty."[*] Trousseau calls attention to the fact of an asthmatic Moldavian boy, five years of age, having a characteristic fit of the gout in the big toe, and that it was the only instance he had ever seen at such an early age.[†] We find urine laden with urates, scalding and excoriating the external parts in young children where fond and foolish parents give them too much meat under the impression that this will make them strong.

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[*] "On the Treatment of Rheumatic Fever by a Non-nitrogenous Diet," 'St Bartholomew's Hospital Reports,' vol. x, p. 359.

Intermittent fever or ague has some connection with rheumatism, but it is exceedingly rare in childhood. I have seen it in a child five years of age, who was reared in a malarious low-lying district. Dr West mentions a case, two years of age.[‡] As the spleen is sometimes found large at birth, it is supposed that it may be owing to the malarial poison. The distinctive features are the absence of rigors, the prolonged hot stage, and no distinct sweating stage. There is no marked crisis as in the adult. The pyrexia may reach 104° or 105°.

Treatment.—This is the same as in the adult, quinine and arsenic being the chief remedies. The syrup of phosphate of iron, and the ammonio-citrate are useful for the anæmia which is always present. The child should be kept warm and sent to the seaside, or some bracing district where the air is pure.

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[*] 'Gout and Rheumatic Gout,' by A. B. Garrod, M.*D.*, 1859, p. 256.

[†] See Chap. XXXIII, on "Asthma."

[‡] Op. cit., 1884, p. 812.

CHAPTER XLIX

RICKETS OR RACHITIS

Nature and Definition—Symptoms—State of the cranium—Changes in the thoracic walls, and long bones—Delayed dentition—Impairment of digestive functions—Character of the urine—State of the intellect.—CAUSES AND COMPLICATIONS—*Congenital history—Period of commencement—Influence of damp and cold—Association with general debility, bronchitis, cerebral exhaustion, laryngismus and hydrocephalus—Its relation to constitutional syphilis—Parental manifestations.*—DIAGNOSIS—*From tuberculosis—Scrofula—Syphilis—Hydrocephalus.*—PROGNOSIS.—MORBID ANATOMY—*Deficiency of earthy salts in the bones—Increase of fat and watery elements.*—TREATMENT—*Importance of milk and fresh air—Cold douche to the head and belladonna to allay sweating—Hypophosphite of lime biscuits—Iron—Quinine—Arsenic—Cod-liver oil the chief remedy—Sea air and sea bathing—Acute rickets—Symptoms—Causes—Morbid anatomy—Diagnosis—Treatment.*

RICKETS is a constitutional malady manifested by depraved nutrition, and an alteration in the shape and composition of the bones. The natural growth of the body is arrested, ossification is delayed, and dentition is retarded. It is "the most common, the most important, and, in its effects, the most fatal of diseases which exclusively affect children" (Jenner).

Although the disease was not unknown to the ancients according to Holmes Coote, it seems to have been scarcely recognised in northern Europe till the beginning of the seventeenth century, when it spread over England and other European countries.*

We find on the authority of Whistler, Glisson, Bate, and others, that when the disease first appeared in the western parts of England, at the period just alluded to, it was called the English malady.[*] A term still retained in Germany, at least in the lecture room, at the present day.

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* 'St Bartholomew's Hospital Reports,' vol. v, p. 125.

In England, Holland, and some districts of France, it is now one of the commonest diseases of children. It is occasionally met with among the rich, and those who are reared in luxury, but it occurs more frequently among the poor, and is best studied in hospital practice. It may be witnessed among strumous and tubercular children, but whether this is accidental, or whether rachitis holds any direct relation to these diatheses, or is a special diathesis, is a matter not yet settled. Opinions are divided on the question. Certainly we often see rickets occur independently of struma or tubercle. Rickets is not, strictly speaking, a disease of the osseous system, but one of mal-nutrition, and it belongs to an unhealthy state of the constitution.

Symptoms—The features which indicate the affection are now very well recognised, owing to the clinical researches of Kolliker, Virchow, Jenner,[†] Gee,[‡] Volkmann, Rokitansky, Holmes Coote, and other authorities. There is, in the first place, always more or less cachexia, the child never looking thoroughly healthy. The head in some cases is markedly deformed, and looks unusually large; but this is to some extent deceptive, because the face is so shrunken and imperfectly developed that it makes the upper part of the head look larger than it really is. In seventeen cases of rickets, the average age being 4·72, the average circumference of the heads was 21·22. In an equal number of non-rachitic children, with an average age of 6·05, the average circumference was 19·95.[§] The bones of the face grow more rapidly in children than the bones of the cranium; on the other hand, in overgrown men or giants, the skull appears small and the forehead low, because the bones of the face, like those of the limbs, have increased out of all proportion to those of the cranium. In rickets, nutrition and growth are checked, hence the face is small.[‖] The sutures are depressed, and feel open when the hand is passed along them; the fontanelles remain unclosed, often to the middle of the second year. The bones of the cranium become abnormally thickened, and the whole skull appears flattened at the vertex, and also at the sides, so as to lose its vaulted form and become box-like. The head is also long and broad, and the width between the eyes is increased. The size of the cranium is therefore large, the sutures remain open, and the parietal and frontal bones are largely developed. Between the ill-developed cranium and the equally ill-nourished brain, there is often fluid, simply filling up the space, and not the result of any inflammatory effusion. Hence this condition has been termed "*spurious hydrocephalus.*"

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[*] 'Dictionary of Medicine,' vol. iii, 1858, p. 643.

[†] 'Medical Times and Gazette,' 1860.

[‡] "On Rickets," 'St Bartholomew's Hospital Reports,' vol. iv, 1868.

[§] "Discussion on Rickets," Pathological Society, 'The Lancet,' 1880, vol. ii, p. 1017.

[‖] See Mr Shaw's "Observations on Lateral Curvature and Rickets," Holmes's 'System of Surgery,' vol. v, 2nd edit., p. 871.

The next characteristic feature of rachitis is found in the osseous walls of the thorax. Owing to the softness of the ribs (for the imperfect ossification of certain bones is a pathological feature of this disease) they yield to the external pressure of the atmosphere during inspiration, and hence become flattened laterally and bent inwards; a transverse constriction is often seen at the level of the junction of the sternum and ensiform cartilage, due to the great difficulty of thoroughly filling the lowest part of the lungs with air. "A second cause is the outward pressure on the lower ribs, caused by enlargement of the liver and spleen, often present in these cases; and a third (which seems rather theoretically probable than absolutely proved) is the inward traction upon the cartilaginous extremities of the ribs by the attachments of the diaphragm. The result is a constriction of the chest, much as though a string had been tied round it below the heart, whilst its apex is distended. Except in very severe cases, this deformity of the chest may be expected to be effaced as the child recovers from the constitutional taint."*

In a rickety child, under my care in 1874, aged 11 years, with congenital hypertrophy of the heart and mitral disease, the whole left side of the sternum was rounded and elevated, and extremely convex, whilst the thorax generally, from the amount of emphysema present, was very barrel shaped and prominent. In a rickety boy, aged nine, under my care in 1878, with mitral regurgitation and hypertrophy after rheumatic fever, the cardiac region was also very rounded and elevated, but, as in the former case, there was a considerable depression or groove running backwards longitudinally from the sternum below the nipples—a groove arising not so much from deficiency of air entering the chest, as from the softening of the bones and their tendency to fall inwards. The common changes are a lateral flattening of the chest, and a prominence of the sternum—in many cases, instead of being nearly circular as in health, it becomes triangular, and the patient presents the well-known appearance of "pigeon breast." This condition is alluded to under chronic enlargement of the tonsils.*

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* 'Surgical Treatment of Children's Diseases,' by T. Holmes, 1868, p. 343.

From the weight of the body the bones of the extremities yield, and the ligaments bearing an unequal strain, cause the articulations to become distorted, and hence we meet with weakened joints and bow-legs; the femur and tibia are bent forward, the arch of the foot is destroyed, while the outlet of the pelvis is narrowed. The limbs becomes so weak that a child, four or five years of age, may not be able to walk, and if it can, it will fall down on meeting with any obstacle in its way. The bones too, from being soft, readily fracture from slight blows. The incomplete or "greenstick" fractures frequent in rickety children are well known to the surgeon. They usually involve the radius and the ulna, but are not rare in other long bones.

The ribs and long bones undergo enlargement, and become soft, spongy, and light, whilst the parietal and temporal bones also become thick and spongy, and the vertebral column often yields and becomes curved. The gravest result of the osseous lesions of rickets lies in the ill-development of the pelvis, the cavity of which may be simply narrow from mal-nutrition of its bony walls or absolutely deformed, from the softened bones falling in and narrowing the brim. Hence follows in after life a frequent cause of difficult labour in women; and even in the male, the extraction of large calculi during lithotomy may be impeded by rachitic deformity of the pelvis. In the case of a boy, aged three years, under my care, both clavicles stood out at a sharp pointed angle in the centre, as though they had been fractured and badly united. The lower ribs were nodulated where they joined their cartilages, and pressed out in a fan-like shape from the enlarged viscera beneath; the upper part of the chest was narrow and contracted, the axillary and infra-clavicular regions shrinking in, the spine was curved, the scapulæ were deformed, and the joints of the larger articulations so loose that they could be twisted in any direction without difficulty.

But the most pathognomonic symptom is the "row of beads" along the junction of the ribs with their cartilages, caused by slight enlargement of the ends of the ribs; this has been termed "the rachitic garland." Dr Hilton Fagge states that "the enlargement is often much more marked on the pleural side than towards the surface."[*] The articular parts of the bones of the extremities enlarge, causing a "double-jointed" appearance very conspicuous at the wrists, due to the enlargement of the epiphyses.

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* See Chap. XI, p. 123.

Rickety children are short and of stunted stature. This would appear to depend on an arrest in the growth of the bones; dentition is delayed and irregular, the teeth not appearing in some cases till the fifteenth or twentieth month. In a case under my care in 1874 a child, said to have been three years old, had no appearance of a tooth. In a case of well-marked rickets in a boy, mentioned by Steiner, the first tooth did not appear till he was four years old.[†] The teeth are small, black, jagged, and pointed, they decay early and soon fall out.

The children are pallid with prominent veins; they shrink and fall away and become thin. There are thirst, accelerated pulse and flushing of the face at night, with broken sleep in all aggravated cases. Fretfulness and irritability are common. Some children almost cry when looked at, and are very timid and alarmed when approached. Such cases are sometimes followed by squinting, defective vision, and hesitation in speech, which gradually disappear as the general condition improves. Headache, after exertion or inability to take food, is a common and persisting symptom. The child yawns, and sighs repeatedly in the daytime, puts his hand to his head as if to remove something, and then closes his eyes and falls off to sleep with one or both eyes half open, for a few minutes, easily waking up again from any noise or disturbance, and uttering a distressing cry. If toys are offered to appease him, he angrily tosses them on one side, and refuses to be friendly with those who have shown him the greatest kindness. These symptoms may of course be seen in cerebral exhaustion from other causes, and they are probably more common in true hydrocephalus than in rickets. It is strange says Sir W. Jenner "to see a little child sitting placidly on the bed, without moving for hours together, its legs placed so as to escape pressure, its spine bowed, its head thrown backward, the chief weight of its body cast on its arms, and to know that, notwithstanding the apparent calm, the tiny thing is, indeed, fighting the battle of life; for it is striving with all the energy it has to keep in constant action every one of its muscles of inspiration, endeavouring so to supply the mechanical defects of its respiratory apparatus due to the softening of the ribs. It wants no toys. It is the best of children if you leave it alone; move it, and you inflict pain upon its tender frame; show it the horse or the doll that was once its delight, and it turns away its head, or stares vacantly; to notice would divert its attention too much from the performance of those respiratory movements which are essential to its existence."*

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[*] "Discussion on Rickets," Pathological Society, Nov., 1880.

[†] Op. cit., p. 222.

Should an eruptive illness, as scarlet fever or measles, supervene, the rachitic condition becomes aggravated.

The abdomen is usually large and distended. This is due to the diaphragm being depressed, and the capacity of the thorax diminished, so that the liver and spleen are forced down below the level of the ribs, as also to their occasional enlargement, whilst the relaxed condition of the abdominal muscles favours the accumulation of flatus, caused by the deranged digestion.† The Germans call it *Froschbauch* (Frogbelly), which accurately describes the appearance; the liver may be felt projecting sharply below the ribs, and the spleen is often very large. The lymphatic glands may sometimes be felt enlarged and indurated in the neck, groins, and axilla. Children in some cases have a sallow, greenish, or chlorotic tint. This was very noticeable in a little girl I saw, who was suffering from tubercular disease in the lung at the same time.

The head, face, and neck perspire remarkably; bead-like drops may be seen on these parts, whilst the trunk and limbs are hot; the veins are prominent over the temples and forehead, and sometimes in the neck and thorax. Occasionally the carotid arteries pulsate strongly, and the heart's action is irritable and excited; but these symptoms are absent in some cases marked by great deformity, while found at other times in less-pronounced cases. The child kicks off the clothes at night, and exposes his limbs, even in cold weather. These are among the earliest symptoms.

The appetite is capricious, and there is oppression and uneasiness after food. Occasionally there is vomiting. The motions are habitually loose, slimy, and offensive, sometimes like those observed in diarrhœa (*lientary*), being curdy and whitish, because the food passes through the bowels partly unchanged, the digestive functions having exerted little influence upon it.

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* 'Medical Times,' 1860, p. 415.

† 'Wasting Diseases of Children,' by Eustace Smith, M.D., 2nd edit., p. 113.

According to Frerichs, both the liver and spleen, in some cases of rickets, are affected with amyloid degeneration.*

Dr Dickinson regards the swelling of the abdominal organs as much a part of rickets as the changes in the bones, and he believes the two to be closely analogous. "There is no new growth or deposit, only an irregular development of the proper tissues of the organs. . . . The earthy salts would seem to be diminished in the viscera as in the bones."†

The urine may contain phosphates and urates, but it is usually clear and pale, even when the appetite is most morbid. In twelve consecutive cases of rickets admitted under my care at the Samaritan Hospital, I found the urine of acid reaction in all; five contained urates, and in three of these the deposit was very copious; two contained phosphates, and the remaining specimens were clear and normal. The highest specific gravity was 1030, the lowest 1020. "The phosphates are more abundant than in health, and a considerable sediment of oxalate of lime is not unfrequent; and it has been observed that urinary calculi are frequent in rachitic children." (Copland.) My colleague, Mr Alban Doran, in 1877, removed an oxalate of lime calculus from the bladder of a rickety girl, who was admitted into the Samaritan Hospital under my care with symptoms of vesical irritation.‡ Large quantities of uric acid crystals have also been noticed (Hilton Fagge).

The swollen joints and distorted limbs are very painful. The little patient screams even when lifted up gently, which is probably due to tenderness of the periosteum, where morbid changes are going on; it is subject to slight muscular spasms, clenching its hands tightly, and prefers to sit and lie about instead of joining in the play of its companions. These spasms may be taken for slight convulsions from cerebral disease, especially if there be malformation of the skull, which has been erroneously attributed to true hydrocephalus.

As regards the state of the intellect, rickety children are generally dull and stupid, and in some cases there is an approach to idiocy; there is lethargy in all their movements and actions, and they do not exhibit the precocity of the tuberculous. Their powers of memory are defective, and they have a difficulty in acquiring knowledge; even when the desire is great they fail under the strain, and headache, restless nights and exhaustion, are common manifestations of the constitutional taint. When precocity of intellect is shown (which I think very rare), the explanation offered is, that the open sutures allow the brain to expand, and its circulation and development proceed more rapidly than when the cranial bones have been unyielding; but this does not seem to me a satisfactory solution, for when the head is disproportionately large, my experience is in favour of a tardy and not a precocious development of the mental faculties.

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* 'Diseases of the Liver,' New Syd. Soc., 1861, vol. ii, p. 175.

† "Discussion on Rickets," Pathological Society, 'The Lancet,' 1880, vol. ii, p. 938.

‡ See Chap. XXIII, p. 242.

Causes.—Parents from constitutional infirmity, excesses of all kinds, and living in crowded and unhealthy localities, impart a general debility to their offspring, which may favour the development of rickets. When, as too frequently happens, the children of such parents are not properly fed, or a farinaceous diet takes the place of the maternal milk, or they are prematurely weaned and neglected, then rickets is invited. Rickets is intimately associated with bad feeding and faulty assimilation. According to Mr Hutchinson, it is a diet disease, defective food being probably the main cause. In 92 per cent. of Dr Baxter's cases farinaceous food of one kind or another had been given before the age of twelve months.[*] Any circumstances tending to the formation of watery blood (hydræmia) in a child, seem favorable to the development of rickets.[†]

Though rickets is peculiar to infancy and very early life, there is some evidence to prove that it is occasionally congenital. From constitutional vice of the parents it may show itself in the offspring, and cases are recorded where it has attacked the fœtus in utero.[‡] But the evidence is not very confirmatory of such a fact. Hilton Fagge and Dr Baxter are of opinion that an infant is never born with so-called "fœtal rickets."[§] Vogel is of opinion that rickets is sometimes hereditary. The parents usually present the peculiarly shaped rachitic head with its projecting tuberosities of the frontal and parietal bones.* Rickets would appear to be most common up to the second year. It is rare after the period of the first dentition in healthy children. "Rickets," says Holmes Coote,† 'commences at the time of life when the growth of bone is most active, namely, in many about the first or second year." According to Guerin, "in 346 cases the disease commenced 98 times in the first year, 176 times in the second year, 35 times in the third year, 19 times in the fourth year, 10 times in the fifth year, twice in the sixth year, extending to the twelfth." He mentions that in three instances it was congenital. Mr Stanley reckons the most frequent period from the eighteenth to the twenty-fourth month.‡ It is common in damp and cold climates, where children are not enough in the open air, and hence it may be that the disease is of greater frequency in northern than in southern latitudes.

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[*] "Discussion on Rickets," Pathological Society, 'The Lancet,' 1880, vol. ii, p. 1017.

[†] "Rickets," by Dr Aitken, 'Reynolds' System of Medicine,' vol. i, p. 801.

[‡] "Rachitis is sometimes developed in the fœtus whilst yet in its mother's womb, even when her health does not appear changed. The museums of pathological anatomy contain several skeletons of those children rachitic from birth."—M. Bouchut, *On Diseases of Infants and Children*, 1855; translated by Peter Hinckes Bird, F.R.C.S.

[§] Op. cit., p. 1018.

There is often a hereditary history of phthisis and brain disease. Three children out of five in one family I heard of were all rickety, and died of mesenteric disease and convulsions. One case came under my own notice; a boy who was a twin, aged five years, was admitted under my care at the Samaritan Hospital, in June, 1877, with a deformed chest and loose joints. I received the following history:—His mother was delicate, and there was phthisis on the father's side of the family. The child had a convulsion during delayed dentition; since then he had been losing flesh, and was weak, irritable, and spiteful. His appetite was ravenous, and he was never satisfied with the food given him. He brought up a great deal of blood, and though the evening temperature reached 102·6° and the pulse 140, no organic change could be detected. After a few days he began to whoop, but the temperature gradually fell to normal, and the cough subsided; the belly was large, the teeth black and decayed, and there was ulceration of the gums.

The rickety condition is associated with general debility, and is often complicated with diarrhœa, bronchitis, pneumonia, whooping cough, the eruptive fevers, tubercular disease of the thorax or abdomen, laryngismus, convulsions, and hydrocephalus. Any of these disorders have an unfavorable effect upon the progress of the malady, for whatever reduces the general strength and weakens the constitution is certain to retard recovery when favorable symptoms have commenced.

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* Op. cit., p. 532.

† Loc. cit., p. 128.

‡ 'Diseases of Bones.'

Of 100 cases of cranio-tabes collected by Drs Barlow and Lees, 70 showed a marked degree of, and 30 a slight degree of, rickets. There were proofs of syphilis in 47 instances, 35 of these being among the well-marked cases of cranio-tabes. It would seem that the connection between cranio-tabes and rickets is very close, and that both affections may originate in syphilis.* Vogel and M. Parrot believe syphilis to be a cause of rickets, but there is no proof in favour of this argument.

Diagnosis.—Rickets differs from scrofulous affections in this respect, that while frequently associated with inflammatory conditions, it is not essentially an inflammation.† The bodily temperature according to some authorities is a little below the normal. In twenty cases under my care I found the morning and evening temperature so nearly normal that the difference was not worth notice. The diathesis of rickets may be confounded with that of tuberculosis and syphilis, yet their local distinctive characters are clear, and can hardly be mistaken when carefully compared with one another. The general symptoms are different, the progress of the disorder is different, and the changes in the bones are absolutely pathognomonic; but since tubercular and syphilitic children may become rickety, through a want of vital power to carry on healthy nutrition, these disorders ought not to preclude the idea of their occasional presence in common. We have already seen that they do occur with rickets and that the existence of either may induce rachitic changes. I have seen a few instances. In rickets the fontanelles are depressed; they do not rise above the level of the rest of the scalp, as in hydrocephalus, and the opening is simply due to an arrest in the osseous development. The antero-posterior diameter is longer than in hydrocephalus; whilst in the latter affection the head is wider, and the face smaller. In rickets the head is frequently unsymmetrical. The change in the articulations, the large joints, the beaded ribs, the alteration in the contour of the thoracic walls, and delayed dentition are all distinctive marks of rickets, and not to be mistaken for any other disease.

Prognosis.—If the disease is limited to the bones, and there is no enlargement of the spleen, or severe anæmia, the child may get well, the disease being arrested as the general health improves. The softened bones may become firm and consolidated, but the deformity may remain for years, or through life. Ultimately the distortion of the long bones is in natural course remedied by their concavities filling with osseous buttresses. If disease of the lungs ensue, and the state of the thoracic walls leads to imperfect expansion of the pulmonary lobules, emphysema or chronic solidification of the lung tissue may arise, and cause dyspnœa and chronic catarrh, which are apt to slowly wear out the child's strength. Bronchitis, when at all acute or recurrent, is usually fatal to rickety children; the ribs fall in with the increased respiratory efforts required, and the feeble heart cannot overcome the blood stasis in the lungs. In one case under my care, the infant seven months old died from spasm of the glottis. Convulsions frequently cause death.

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* Jones and Sieveking, op. cit., p. 845.

† "Pathology of Rickets," 'Brit. Med. Jour.,' Nov. 20, 1880.

Morbid anatomy.—The composition of the bones shows an increase in fat, watery elements, and carbonic acid. The bones are soft, light, and easily bent or broken. They contain a deficiency of earthy salts, because those salts have never been deposited in them; just as in *mollities ossium* the bones are soft, because their earthy salts have been removed by absorption. The lacunæ are enlarged, and there is a great thickening of the periosteum. The mal-nutrition of the system interferes with the gradual conversion of the deeper layers of the periosteum and articular cartilage into bone; the bone when formed is imperfect. The morbid condition of the osseous system brings about visceral changes, especially in the thorax, where respiration is so much impeded, but special changes in the internal organs due to rickets have not been very clearly made out. The wrists are the first parts of the body generally to show these changes, the ends of the radius being large and distorted, and then come the sternum and ribs, often irregularly projecting and flattened.

Dr Goodhart has noticed the blood in many cases of rickets to be deficient in corpuscles in some and in colouring matter in others.*

Treatment.—The first and most important point is to ascertain the cause of the disease. If it has appeared during the time when the child is still suckled at the breast, it may be, that the mother or the nurse cannot nourish it, and then proper food must be supplied. To speak generally, it may be said that the victims of this disorder should be at once supported by plain and simple food—such food as can be assimilated, and easily digested, according to the age and strength of the sufferer. Milk should enter largely into the diet at all stages. If the child is an infant, and the mother's milk is good, it should be kept at the breast for the full period; if it has been weaned, and is not more than two years old, there is no better form of nutriment than a plentiful supply of good cow's milk. Beef tea, or other animal broths, may be given according to circumstances. Diet is of the first importance. Children who have reached the age of two years should have pounded beef or mutton with good gravy. A teaspoonful of Mellins Food, or "Squire's Malted and Cooked Food for Infants," is very serviceable dissolved in boiling milk. Fifteen or twenty minims of the saccharated solution of lime greatly assists the digestion of the milk.

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* 'The Lancet,' 1881, vol. i, p. 49.

In the south of France it is found that puppies fed on human milk become rickety, and recover when again fed on their mother's milk. It has been proposed to try bitch's milk for the treatment of rickets in the human infant.

These children should be well sponged night and morning, and afterwards rubbed with a dry towel, so as to excite a healthy action of the skin. They should be out of doors in the daytime as much as possible, and the sleeping apartments be cool and well ventilated. Warm clothing is most essential. They should lie on mattresses instead of soft beds, and the pillow should be so arranged that the head does not sink into it, as this is certain to increase the restlessness and sweating. To arrest the exhausting perspirations, the head may be douched with cold water night and morning, and the body quickly immersed in a tepid bath containing Tidman's sea salt. The tincture of belladonna is useful in combination with iron to allay sweating.

If the bowels are deranged, and digestion is not satisfactorily proceeding, it will be advisable to correct the disordered state by a few grains of bicarbonate of soda and rhubarb, or sulphate of potash and rhubarb (Form. 84). It is sometimes necessary to give a grain or half a grain of calomel, or two or three grains of grey powder. In this way the slimy or pasty motions will be altered, and the evacuations be rendered more natural and healthy. Some caution is required not to mistake the whitish motions caused by undigested milk for the absence of bile. Mercurials and alteratives, if prescribed in such cases, would do harm. We should trust to giving lime water with the milk, and such simple remedies as will correct flatulence and acidity, or we must even suspend the milk altogether for a time, and substitute week beef tea and barley water.

If diarrhœa should be troublesome, a drop of laudanum with an alkaline and bismuth mixture will be very useful (Form. 25).

When there is sickness, high-coloured urine, and mental irritability, bromide of potassium, with sal volatile and citrate of potash will be useful. Later on quinine, citrate of iron and quinine, the ammonio-citrate of iron, the solution of dialysed iron (liquor ferri dialysati) the syrup of phosphate of iron, or Parrish's chemical food must be prescribed. Steel wine is extremely useful, and one of the very best forms for administering to rickety children. Sir W. Jenner advises a teaspoonful or two of the wine, with half a grain of quinine, and a drop or two of sulphuric acid to be taken twice a day before meals.[*] I have found this preparation of iron very serviceable when combined with arsenic in the formula recommended by Sir Erasmus Wilson.[†] Arsenic promotes appetite and increases the tone of the digestive functions; moreover, according to Ringer, it is of service in chronic dyspepsia and diarrhœa, where the motions contain undigested food.[‡]

But cod-liver oil is our chief remedy, and it has taken the place of almost every other. It should be prescribed early, there being scarcely any complication which prevents its administration. Cough and diarrhœa yield to it, and the secretions improve under its steady continuance. It should be given in milk, orange wine, or orange juice, twice a day after food. Half an ounce in the course of twenty-four hours is a sufficient quantity. Dr Norman Moore mentions the fact that some beagle pups fed on dog biscuits soon after birth were noticed to have their legs bent, their joints enlarged, and their ribs beaded, but under cod-liver oil they soon ceased to show any signs of rickets.[§]

Cough must be treated in accordance with the pulmonary complication that is present. Depressing drugs, like antimony and mercury, are never justifiable for the bronchitis and pneumonia of rickety subjects, but in place of them, ipecacuanha, carbonate of ammonia, citrate of potash, and senega should be given.

If laryngismus should arise (and the association is not uncommon), then iron, cod-liver oil, and bromide of potassium will be useful. The hypophosphite of lime biscuits prepared by Van Abbott, Princes Street, London, at the suggestion of Mr W. Adams, may be given with advantage. Each biscuit contains five grains of the hypophosphite, which may be taken three times a day. If the child remains delicate, sea air or even sea bathing is most valuable; Yarmouth or Lowestoft in the summer; Clifton, Torquay, or the Isle of Wight in the winter, may effect a more rapid improvement than any drugs.

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[*] On Rickets,' op. cit., p. 467.

[†] Form. 93:
℞ Vin. Ferri ℥iss
Syr. Tolut. ʒiij
Liq. Fowleri ʒj
Aquam ad ℥iv. M.
} A teaspoonful in a tablespoonful of water twice a day after food.
For a child from five to ten years of age.

[‡] 'Handbook on Therapeutics,' 4th edit., p. 253.

[§] 'The Cause and Treatment of Rickets,' 1876, p. 32.

In many cases, the inunction of cod-liver oil, olive oil, or neats-foot oil is very useful.

Where the deformity of the joints and bones is great, the child should be prevented from walking, and properly adapted splints employed. A bandage worn round the lower ribs and abdomen gives great support to the weakened muscles. In the case of female children afflicted with rickets, particular care must be taken to keep them off their feet, until some suitable apparatus has been applied, so as to avoid the characteristic deformity of the pelvis, which would expose them to great dangers should they live to bear children. These deformities consist in a diminution in the antero-posterior diameter, due to the sacrum and lower lumbar vertebræ projecting too far forward, and to a further narrowing of the inlet from the approximation of the acetabula.

Acute rickets (*infantile scurvy*) is as rare as chronic or ordinary rickets is common, and is described as a different disease. Steiner has only seen it twice out of several thousand rickety children.[*] It occurs at a very early age, chiefly in children of a few months old to two years. Out of 31 cases 7 died. Mr Thomas Smith has recorded a case under the name of "Hæmorrhagic Periostitis."[†] Dr Gee calls it "Osteal or Periosteal Cachexia."[‡] Dr. Barlow, "A Combination of Scurvy and Rickets."[§] Dr Cheadle, "Osteal or Periosteal Cachexia and Scurvy."[‖]

Symptoms.—Great fretfulness is a marked feature of the affection, owing to pain in the limbs which is excessive when they are touched. The child often moans, as if in constant pain, and the strength is reduced. The thighs are oftener affected than the legs, but both lower limbs may be swollen, tense and shining, and there is a varying amount of œdema of the affected limb, and sometimes undue prominence of the superficial veins. The scapulæ, the bones of the cranium, and upper extremity may be involved. The skin is generally pale, and the complexion of a dirty sallow tint; the gums are usually spongy, with a tendency to bleed. There is generally some pyrexia, but it is not considerable. Severe sweating of the head is often present as in simple rickets. After a time, in favorable cases, the swelling diminishes in the soft parts, leaving the thickening of the bones appreciable. This ultimately subsides, and the deformity disappears.

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[*] Op. cit., 1874, p. 310.

[†] 'Trans. Path. Soc.,' 1876, p. 219.

[‡] 'St Bartholomew's Hospital Reports,' 1881.

[§] 'Med.-Chir. Trans.,' vol. lxvi, p. 159.

[‖] 'The Lancet,' vol. ii, 1882, p. 48.

Causes.—The disease has been witnessed in some children the subjects of congenital syphilis, but in many cases it has not been present. Delicacy has been traced to the parents, and there have been ordinary rickets in some children of the family, not in all.

Any form of diet deficient in the elements of nutrition may produce it, and in many cases it has been traced to artificial foods and insufficient milk. Most authorities on the subject agree with Dr Cheadle, that the disease is invited by a "scurvy" diet, or one that does not include milk, fresh vegetables, and fresh meat.*

Morbid anatomy.—In fatal cases an effusion of blood has been found under the periosteum (subperiosteal hæmorrhage) of the affected bones, which is thickened and vascular. There is sometimes extravasation of blood among the muscles, and the shaft of the bones is separated from the epiphyses, which are often enlarged and tender.

Diagnosis.—The disease is considered a combination of rickets and scurvy, and from all that has been written on the subject, it would appear to be closely allied to the latter affection. But it differs in the inequality of the two wrists when involved, the greater tenderness and rapid swelling of the limb compared to that of ordinary rickets. The character of the limb enlargement, the sallow look, and the spongy state of the gums are essentially scorbutic. The swelling of the limb is due to hæmorrhage beneath the periosteum, and to the extravasation of blood into the deeper muscular layers, and serum superficially. The hæmorrhages that occur in purpura and scurvy are probably due to the same cause.

Treatment.—This consists in avoiding all movement, and surrounding the affected limbs during the acute stage with wet compresses, thoroughly wrung out, and changed every two hours. A dry cloth to be applied over them. In Mr Herbert Page's case of "Subperiosteal Hæmorrhage of Three Long Bones in a Rickety Infant" free incisions were made in the leg and thigh under chloroform, and huge blood-clots lying between the bones and their covering had to be broken up and drainage-tubes inserted; this was followed by immediate improvement and gradual disappearance of the swelling.[*] In the chronic stage, shampooing with oil, and douches first of tepid, and then of cold sea water. Improvement generally follows antiscorbutic remedies, as raw meat juice, fresh milk and vegetables, orange juice, and cod-liver oil. Pure air is essential.[†]

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* "On Three Cases of Scurvy Supervening on Rickets in Young Children," 'Lancet,' 1878, vol. ii, p. 685.

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[*] 'Med.-Chir. Trans.,' vol. lxvi, p. 221.

[†] "On Cases described as Acute Rickets," by T. Barlow, M.D., 'Med.-Chir. Trans.,' vol. 66, p. 161.

CHAPTER L

SYPHILIS IN CHILDREN

HEREDITARY SYPHILIS—*Its source—Rarity in the upper classes—Frequency in the lower classes—Quite distinct from acquired syphilis in children—Symptoms—External, well marked and well known—Internal, less constant—Enlargement of the liver, spleen, and lymphatic glands—Effects on the osseous system—Craniotabes—Malformed teeth—Interstitial keratitis.*—PRIMARY SYPHILIS *through direct infection—Through vaccination.*—DIAGNOSIS.—PROGNOSIS.—TREATMENT.—*Mercury the only reliable remedy—Mercurial inunction—Good feeding important during the administration of mercury—Iodide of potassium*—VAGINAL DISCHARGES *in female children—Diagnosis from gonorrhœa, with which it is so often confounded by parents—Its relation to debility and the strumous diathesis—Treatment.*

ONE of the saddest facts revealed by medical and surgical research is the transmission of syphilis from a parent to an innocent child. However clear may be the origin of the disorder, whatever form the disease may assume in the father or mother, it is now well known that in infancy it appears in a distinct character, differing from what may be termed the adult variety in many points, though it is only of late years that infantile syphilis has been thoroughly investigated.

The manner in which syphilis is transmitted to a child is obvious; and it is now admitted that a syphilitic father may beget an infected fœtus, which infects the mother. Hence healthy women may give birth to syphilitic children, and they may suffer from secondary symptoms, even though they have never had the disease in its primary form. Inoculation of the mother through the fœtus has been experimentally proved by Mr Savory. But, of course, direct infection from the mother is equally possible, and it is probably the ordinary mode by which an embryo is syphilised.

In constitutional syphilis the child becomes infected through the vitiated blood of the parents, or the semen of the father. The symptoms that ensue are altogether different from those which follow secondary syphilis in the adult.

Hereditary syphilis is very rare in the upper classes, even among the children of men who have been avowedly profligate before marriage, and who admit that they have suffered from syphilis. Careful attention to medical advice, and good feeding help to eradicate the disease, or to destroy its property of transmission.

The disease must be distinguished from the primary form which a child may contract from a diseased nurse, or in vaccination.

Women affected with secondary syphilis are very liable to miscarriage. When a child presents signs of the disease, a history of frequent abortions in the mother is significant. Intra-uterine syphilis may, and frequently does, kill the fœtus, the poison exerting its action either upon it, or the uterus and constitution of the mother. The body of the fœtus at birth presents evidence of the disease. "In 92 examinations of macerated syphilitic fœtuses recorded by Mewis, the spleen was diseased in 72; the bones were affected by osteo-chrondritis in 64; the liver was diseased in 56; the pancreas in 14; the suprarenal bodies in 11; the lungs in 3; and the skin in one."[*]

The child may be born with syphilis, and then it is small and shrivelled looking; it whines and cries feebly; the skin is of a coppery hue, rough and scurfy; the lips are fissured and the margin of the anus is ulcerated. Sickness, flatulence, and disinclination for food are common, and death is early and frequent. But, strange to say, as a rule the disorder does not manifest itself till a month or six weeks after birth.[†] At this period the child, previously well nourished, begins to lose flesh and is affected by constant snuffling, due to some morbid change in the mucous membrane of the nasal fossæ. This symptom becomes very troublesome and seldom fails to attract the attention of the child's nurse and mother. The "snuffles" is a name in common use for the complaint. It signifies a kind of coryza, a discharge from the nose of a semi-purulent or sanguineous nature, which in some cases blocks up the nostrils and prevents the child from sucking. This is a very grave condition. The patient is now found to be covered with a dull red eruption in large patches. The spots are of a coppery hue on the skin, though sometimes bright, resembling roseola. Large leprous patches, inclined to be dry and scaly, may be often seen at the outer and upper parts of the thighs, and ragged ulcers and condylomata extending in males from the base of the scrotum to the anus. There are fissures at the bend of the joints, mucous patches of redness, pemphigus, and even ulcerative ecthyma in some instances where the taint is severe. Large ulcers are sometimes seen on the buttocks and inside of the nostrils in severe cases, and superficial ulceration is present on the fingers and toes. Ulcers or patches of ulceration form on the mucous membrane of the mouth and the angles are often fissured and bleed easily. A case of "Desquamative Syphilis of the Tongue" is recorded in a child three months old. There was an eruption on the nates and later on two small red patches of ulceration on the tongue; the interval between them became coated with thickened epidermis resembling thrush.* Ulceration of the tongue is frequent. In a few weeks the child becomes thin, its skin is loose and deeply wrinkled, and of a dirty soot colour where not covered by the eruption. The colour has been said to resemble that of coffee mixed with milk (*café au lait*), and this is most apparent in the face and forehead. These children have "the look of little old men."† The hair is scanty, the eyebrows and eyelashes being often absent; the child is affected with "a peculiarly hoarse cry," or a modification of the voice not unlike the changed voice of syphilis in the adult. He is restless and fretful, and cannot obtain sleep, particularly at night, because the pains are then more severe. As time passes on, the child becomes miserably emaciated, and is liable to sink at any time from diarrhœa, bronchitis, or pneumonia. Cold, followed by some thoracic affection, often carries off delicate and half-starved children. Extreme anæmia is sometimes present, and thickening of the mucous membrane of the larynx, causing laryngitis, and even ulceration may ensue.

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[*] Mewis, 'Zeitsch. f. Geburtshülfe u Gynaekologie,' 1879, p. 43. Quoted from Berkeley Hill, op. cit., p. 3

[†] Out of 158 cases collected by Diday 131 children presented symptoms before the end of the second month, 110 had symptoms before the end of six weeks, and 86 before the end of the first month. He concludes:—"1. That the greater proportion of outbreaks of constitutional syphilis in newborn children occur before the completion of the first month of their existence. 2. That when the third month is once past there is no longer much probability that any symptoms of this kind will manifest themselves."—'Infantile Syphilis,' p. 102.

Vaccination frequently brings out a specific rash in children congenitally syphilitic, who may not have exhibited before that period any evidence of the taint. A very general rash of characteristic form and hue may show itself as early as the fourth day after the act of vaccination. This at once demonstrates that the taint was not conveyed in the vaccine lymph employed.

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* 'Path Trans.,' 1881.

† Diday, op. cit., p. 86.

An infant in this condition is well known to all medical men who attend out-patient practice at a London hospital. The little sufferer seldom, if ever, fails to exhibit the characteristic external appearances of this disease. The syphilitic affection can readily be distinguished from any other form of marasmus; the snuffling and wasting always predominate at first over symptoms of internal derangement. The disease may be followed, but is not usually preceded, by vomiting or irregular action of the bowels. When, however, syphilis is suspected, but there is no marked rash, mucous tubercles may often be detected around the anus and pudenda, and desquamation of the palmar and plantar cuticle generally exists, or scales like those in psoriasis and lepra peel off the hands and feet. One of the most absolutely pathognomonic evidences of congenital syphilis is a coppery blush extending from the anus to the nates; it is found only during the early months of infantile life.

We have been speaking of the external symptoms of hereditary syphilis. The next question that naturally suggests itself is: What internal lesions occur in this malady? But this question is hard to answer, for visceral symptoms are seldom well marked in these cases. In some patients no characteristic morbid change is found after death. The bones are most frequently affected. Mr Holmes, after describing the well-known external signs of hereditary syyhilis, remarks:—"Finally, certain lesions or degenerations of the principal viscera have been pointed out as peculiar to congenital syphilis; but I cannot say that the evidence on this subject appears to me very conclusive, at any rate, these lesions are of little moment in practice, inasmuch as no means exist of recognising them before death."*

Diday admits the difficulty of recognising the syphilitic changes. Sometimes the enlarged and indurated liver may be felt through the thin parietes, and peritoneal effusion, anasarca, and other symptoms indicating obstruction to the circulation through the organ have occurred; but neither, according to his experience, nor that of Gubler, whom he quotes, has jaundice in any instance been seen.†

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* 'System of Surgery,' art., "Surgical Diseases of Childhood."

† Diday, 'On Infantile Syphilis,' New Sydenham Society, 1859, p. 94.

A most interesting case, showing to what extent the viscera may be implicated in this disease, even in an infant of three months, has been described by Dr Coupland.[*] It must be remarked, however, that the sole evidence of syphilis rested on the fact that the child's mother had been five times pregnant; the firstborn alone surviving. Two children were still-born, once the mother miscarried, but the fifth confinement resulted in the birth of the patient, who "had been to all appearances healthy to within three hours of its death, when it began to suffer from shortness of breath." The visceral lesions were those seen in tertiary forms of syphilis among adults. Large gummata were found in the liver, and a small gummatous nodule was detected in the right lung. The cortical portion of the kidneys and the walls of the heart were infiltrated with small round cells. The singular cardiac complication accounts for the sudden death of the patient.

Dr Gee observes that the spleen is much enlarged in about one fourth of the cases of hereditary syphilis, and that sometimes enlargement of the liver and lymphatic glands is superadded.[†] Whether the relation will hold generally good may admit of some doubt, because it may possibly arise from the cachectic condition of the system attendant upon the syphilitic infection. Still, there can be no doubt of the frequent association of syphilis with hypertrophic enlargement of the spleen.[‡]

Of recent years the effects of syphilis have been observed in the osseous system. Some authorities regard these changes as similar to what is seen in rickets. The long bones, especially the tibia and humerus, are most frequently involved, then those of the cranium, ribs and scapulæ. The long bones are liable to take on two forms of change, though they may be combined. 1. That beginning in inflammation of the periosteum. 2. That commencing in the bones itself. "The growth may be formed by a single layer, but in many cases several layers can be made out. The periosteum is nearly always thickened and clings closely to the osteophyte, which is infiltrated with a large quantity of calcareous salts that gives it a chalk-like aspect. The bony swelling may vary from one tenth to three eighths of an inch in thickness on the shafts of the long bones, but may reach an inch or more on the flat bones of the skull. The line of demarcation between the natural bone and the new growth is usually sharply defined."* These changes do not appear to involve caries or necrosis; if the patient recover, all the morbid growth disappears, and the worst result is a certain amount of bending or distortion of the bone.

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[*] 'Trans. Path. Soc.,' vol. xxvii, p. 303.

[†] "On Enlargement of the Spleen in Hereditary Syphilis, and in some other Diseases of Children," Roy. Med. and Chir. Soc.," Lancet,' April 13th, 1867.

[‡] 'Pathological Anatomy,' by Wilks and Moxon, 1875, p. 475.

Craniotabes is often seen in congenital syphilis among infants and young children. Attention was first directed to it by M. Parrot in 1877. Drs Barlow and Lees have reported several cases.† ‡ The skull presents broad, irregular, or oval and elevated masses ("bosses") of a greyish or maroon colour unlike the rest of the calvaria, which may ultimately coalesce and form a general thickening. The frontal, parietal and occipital bones may be all thickened by these osteophytic growths. The thickening generally takes place about the cranial sutures and anterior fontanelles. The sutures are obliterated and the point cannot be made out where the two bones are joined. After death the thickened portion of skull presents a finely granular or worm-eaten appearance compared with the normal bone, which is smooth. The destruction may extend to the dura mater itself in some cases. The inner table may be unchanged, or disappear altogether. The thickened as well as the thinned portion of bone in some cases are remarkably flexible like parchment, and yield to outside pressure. The new bony material appears to originate in the deeper layers of the periosteum, and to depend upon an altered state of nutrition, and not on inflammation.

An infant afflicted with hereditary syphilis is remarkably amenable to treatment, the more so because mercury is not liable to act prejudicially on very young subjects, on whom it exercises its anti-syphilitic tendencies as well as on the adult. But the mortality among syphilitic children is known to be high. As they grow older, if they survive, several fresh symptoms develop themselves. The milk teeth are brittle, and very prone to caries. The permanent canines and incisors develop very characteristic peculiarities, first pointed out by Mr Hutchinson. The upper middle incisors are the most characteristic in these cases. They are smaller than usual, wide apart, and their edges are deeply crescentic. When first cut small friable tubercles project from the crescentic borders, but these are soon broken off. Deafness, both from disease of the tympanum and affections of the labryinth, is frequent among syphilitic children. Another symptom, also first detected by Mr Hutchinson, is a disease of the cornea, termed "*interstitial keratitis.*" This disorder is almost always accompanied by the characteristic deformity of the teeth. It appears after the fifth year. The cornea becomes uniformly hazy, with a few interspersed whitish dots; it is found to be also singularly vascular. According to Mr Holmes, iritis is a rare symptom of infantile syphilis.* There are also to be noticed some prominence of the forehead, flattening of the bridge of the nose, linear cicatrices at the angles of the mouth, and the palate presenting the form of the Gothic arch.

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* Berkeley Hill, op. cit., p. 348.

† 'Path. Trans.,' 1879, pp. 333 and 350.

‡ Ibid., 1880, p. 236.

Primary chancres occurring on the genitals of children from direct infection through brutal outrage, or early depravity, do not differ from the same sores seen in adults. They are of interest from a medico-legal point of view. Where a sore exists on the genitals of a mother at the time of parturition, a child may become infected, but it is exceedingly rare, and the evidence furnished on this point is by no means conclusive.

Infection from the nipples of diseased nurses, produces in childhood the symptoms of primary, followed by secondary syphilis, without the distinguishing features of the hereditary type of the disease. A remarkable case is recorded by Dr Dowse. A girl, ten years of age, contracted syphilis from an infant she was nursing through a slight abrasion on her forearm. The disease was very severe and proved fatal.†

Lastly, syphilis may be communicated through vaccination, a chancre appearing at the point touched by virus from a syphilitic subject. Of course, this terrible complication suggests great caution in guaranteeing the purity of lymph, as insisted on by Mr Henry Lee. It must be taken from the vesicles not later than the eighth day, unmixed with blood, or any other secretion. Of the manner in which syphilis is propagated by vaccination, it is recorded "that in a district of Piedmont, in the year 1861, where syphilis, if not unknown, was at any rate so rare that the medical men in the neighbourhood had no opportunity of seeing it, forty-six children, of various ages, were simultaneously attacked with well-marked syphilis, proceeding in all the cases which could be properly examined, from chancres in the arms, followed by buboes in the axilla; and that all these children had been vaccinated, directly or indirectly, from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and, further, that these children transmitted the same disease to a number of children, their wet-nurses, mothers, &c., and even to children who nursed and played with them; that the women so infected, in turn infected their husbands; and finally that the disease yielded in all cases to the usual remedies for syphilis."* Several similar cases are recorded.

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* 'Surgical Treatment of Children's Diseases,' 1878, p. 351.

† 'Clin. Trans.,' vol. x.

Diagnosis.—The general history of the case, the "snuffles," the eruption of the skin, and the sallow parchment-like hue of the countenance, distinguish it from all other diseases. In some cases "snuffles" is the solitary evidence of the disease, in others cranio-tabes, and in others again laryngitis. There is not much fear of confounding noma pudendi with venereal phagedena, though dishonest parents might falsely give a syphilitic history of the former complaint.

Prognosis.—Many syphilitic children fall into such a bad state of health that they slowly waste and die. When the nose is obstructed by mucus in infants, so that they are unable to suck, the complaint often proves fatal. Then, too, if a child is attacked with an inflammatory or eruptive disease, or even a mild form of diarrhœa, it is prone to succumb from exhaustion.

Treatment.—Mercury is an invaluable remedy in congenital syphilis, and without it there is no probability of eradicating the disease. It should be employed in every case, and if there be any doubt in diagnosis it should not even then be withheld. Every night and morning a grain of the Hyd. c Creta should be given, to which a little Pulv. Arom. cum opio, or, what is preferable, Pulv. Ipecac. Co. should be added if the bowels are inclined to be loose or there is a tendency to colic. When the symptoms are improving, the dose of the mercury may be reduced to half a grain night and morning. This form is preferable to calomel or the perchloride of mercury; it is less likely to cause diarrhœa and is not so depressing. I have sometimes given the perchloride in combination with the tincture of bark when there has been considerable debility and cachexia. Mercurial inunction is warmly advocated by some, and among them the late Sir B. Brodie, who contended that mercury, internally administered, seldom cured the patient, whilst externally applied, he had never known it to fail. "It may be done by spreading fifteen to thirty grains of mercurial ointment diluted with its weight of lard or vaseline on a piece of flannel which the child wears constantly round his waist. The ointment should be renewed on the flannel every night; and the child's skin ought to be carefully washed with soap and water every third or fourth night before the flannel is replaced. Rubbing the ointment into the skin is also practised, and mercury is very safely introduced by this means, though there is some risk of irritating the skin by friction. Another method is to bathe the child twice daily in a solution of perchloride of mercury of about one sixth of a grain to the ounce of water. This is more uncertain than inunction, and, according to Diday, sometimes produces a sudden and violent erythema of the surface of the body."[*]

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* 'Surgical Treatment of Children's Diseases,' by T. Holmes, 1868, p. 353.

Iodide of potassium is seldom necessary, most cases being readily and thoroughly cured by mercurials. Still, the salt has been used with excellent effect when the child has had much mercury, or the syphilis is long in yielding. It has cured obstinate ulcers about the tongue and fauces in children affected with hereditary syphilis. In *interstitial keratitis*, the use of iodide of potassium is advisable. It may be given to the the child in water with a little syrup, or in milk.

When the syphilitic taint is disappearing and debility is the chief symptom to contend with, the syrup of the iodide of iron is an excellent remedy. It may be given during the day, whilst the mercurial is taken only at bed time, or the latter may be discontinued for a short time and then resumed. Cod-liver oil is of great service given in milk and lime water after meals. "The solution of perchloride of mercury in cod-liver oil is very useful for infants." (Berkeley Hill.)[†]

The treatment ought to be continued over a period of six months.

Up to the period of the second dentition, conditions of anæmia in the subjects of congenital syphilis are not improved by iron, unless it be combined with mercury.

When the nostrils are obstructed they should be syringed with warm water twice a day, and the inspissated mucus removed with a camel's hair brush dipped in water. The excoriations are to be touched with red oxide of mercury or a weak solution of nitrate of silver. The mouth requires to be cleaned after each meal with a piece of sponge, and any sores or aphthous patches lightly touched with a solution of borax or nitrate of silver. Though these remedies are useful, and even necessary, the influence of mercury is generally sufficient to arrest the inflammation of the nasal mucous membrane, and is most to be relied upon. Condylomata are to be kept scrupulously clean, and dusted night and morning, with equal parts of calomel and oxide of zinc.

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[*] 'On Syphilis and Local Contagious Disorders,' by Berkeley Hill, F.R.C.S., 1881, p. 449.

[†] Hyd. Perchlor. gr. ii
Æther. Sulph. ʒj
Misce et adde Ol. Morrhuæ ℥vj
ʒj contains gr. 1-24 of the perchloride.

The diet is of great importance. If the mother has sufficient milk, she ought to suckle her child, as it will have a much better chance of recovering. If she cannot do so hand-feeding must be trusted to. Good cow's milk, ass's or goat's milk, veal or chicken broth, weak beef tea, are the best forms of nourishment. A few tea-spoonfuls of cream with sugar and lime water have been recommended when milk is rejected and keeps up diarrhœa.*

If there be much exhaustion, ten or fifteen drops of brandy may be given in milk or in plain water three or four times a day. Older children will often take a little raw meat juice, or pounded meat between bread and butter. The child's body should be kept warm by means of a flannel roller, which has a tendency to check vomiting when present, and to relieve flatulent distension of the bowels.

Vaginal discharges of a muco-purulent character are frequently observed in female children who are delicate, and of a strumous habit. The complaint occurs during dentition, from intestinal irritation, ascarides in the rectum, and after scarlatina and other fevers. These discharges are almost invariably attributed by parents to some specific taint, and they sometimes imagine the child has been brutally treated. The symptoms are much less severe than in gonorrhœa. The complaint occurs in children of a few months old, though it is more often observed in those of six or seven years of age. The disease is obstinate in character, and may persist in spite of cleanliness and the most careful treatment.

The *symptoms* are redness of the vulva, and the lower part of the vagina, as may be seen on separating the labia. A thick muco-purulent discharge issues from the vagina, and the source of the disease is higher up than is generally imagined. Sometimes there is no local discomfort, but if the discharge has been of any considerable duration, then the parts are sore and there is pain during micturition.

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* Berkeley Hill, op. cit., p. 451.

The *treatment* best adapted to cure the complaint is to well foment the parts, night and morning, with warm water. When there is much local irritation and redness it should be continued till relief follows. Sitting the child for a few minutes in a hip bath before going to bed is soothing and comfortable. After this a lead lotion should be applied twice or three times a day. The child should not be permitted to run about till a piece of cotton wool, well spread out, has been laid between the labia, so that the contiguous sides do not approximate. The discharge is then soaked up by the wool instead of trickling around the perineum and adjoining parts, which increases the irritation. When the inflammation has subsided, an astringent injection of alum and zinc may be employed, and if the disease should prove rebellious to treatment, a nitrate of silver lotion may be substituted, and tonics, cod-liver oil, and sea air will be advisable.

CHAPTER LI

DISEASES OF THE BLOOD, ETC.

PURPURA—*Two varieties*—1. *Purpura simplex*—2. *Purpura hæmorrhagica*—*Causes*—*Diagnosis*—*Prognosis*—*Treatment.* HÆMOPHILIA—*Symptoms*—*Pathology*—*Prognosis*—*Treatment*—*Scurvy.*—ANÆMIA—DIVISION INTO—1. ACUTE ANÆMIA—*Symptoms*—*Causes*—*Treatment.* 2. CHRONIC ANÆMIA—*Causes*—*General and physical signs*—"*Humming-top sound,*" *how produced*—*Effect of pressure with the stethoscope in increasing or diminishing the intensity of arterial and venous murmurs*—*Case in illustration*—*Death sometimes results from deterioration of the blood alone, without any organic change*—*In some cases there is fatty degeneration of the heart.*—TREATMENT—*Importance of rest if the heart is feeble*—*Preparations of iron, especially the ammonio-citrate of iron*—*Syrup of hypophosphite of iron*—*Iron lozenges*—*Belladonna*—*Schwalbach water*—*Change of air.*—IDIOPATHIC ANÆMIA—*Prognosis*—*Treatment.*

Enlargement of the cervical lymphatic glands.—LYMPHADENOMA (*Hodgkin's disease*—*Adénie Trousseau*—*Anæmia lymphatica*)—*Leucocythemia.*

Purpura is a form of hæmorrhage, not infrequent in childhood, which takes place into the upper layers of the cutis, beneath the epidermis, and into the subcutaneous areolar tissue. Sometimes the mucous membranes are involved, and there is bleeding from the bowels, kidneys, stomach, nose and gums. Purpura varies in degree and extent. In mild cases there are small petechiæ on the skin, resembling flea-bites scattered over the body, and this is designated "*purpura simplex.*" Such cases may be seen among poor and half-starved children, quickly subsiding as their nutrition improves. There may be slight sickness and diarrhœa with a little blood in the motions. In one of my cases, about two teaspoonfuls the fathers transmit it to their sons. Jews are very liable to the affection.

Symptoms.—These begin during the first year or two of life, and the bleeding occurs from the most trivial causes. A physical examination detects nothing wrong in the chest or abdomen. The bleeding takes place from the skin, the mucous membranes, into the subcutaneous tissues, and cavities of the joints, particularly the knee. Epistaxis is the most common form of hæmorrhage. The most severe case I have seen followed the extraction of a tooth; it may also happen from division of the frænum linguæ, leeching and vaccination. The loss of blood is sometimes so large in quantity that death has followed in a few hours.

Pathology.—The disease consists essentially in over-repletion of the vascular system. The blood is unusually fluid. The aorta and larger arteries are abnormally small in calibre as compared with the veins, and the walls of the vessels are conspicuously thin. Large veins can generally be seen beneath the somewhat translucent integument. These anatomical changes are sufficient to explain the frequency of hæmorrhages. The swelling of the joints is considered to be due to extravasation of blood within the articulations.

Diagnosis.—This may be confounded with purpura in its more aggravated forms, but the history of the case, the sex of the patient, the repeated bleedings from early infancy in a child hereditarily predisposed, and the affection of the joints, are conclusive proofs of the disease before us.

Prognosis.—From the liability of severe hæmorrhage there is risk to life at any time. With great care in the opening of abscesses, the extraction of teeth, &c., the ordinary term of life may be reached if the general health can be maintained. The joint affection is tedious, and often attended with pain and febrile disturbance.

Treatment.—All remedies fail to exert any decided influence over the disease. The tincture of the perchloride of iron is the best remedy among drugs. Warm clothing, good food, and a mild climate are to be recommended. If life is threatened, transfusion or the intravenous injection of saline fluid may be adopted. The joint affection requires rest and splints.

Scurvy is a very rare disease in childhood, but it is occasionally caused by a scorbutic regimen when farinaceous food in place of meat, vegetables, eggs, and milk have been long indulged in. The of blood were passed for some days with each motion, the urine deposited thick white urates on standing, and there were copious phosphates. The child was very anæmic, and the disease was preceded by faintness, loss of appetite and arching of the limbs a fortnight before the spots appeared. Hæmorrhages are generally to be seen in the fundi oculorum.

Purpura is generally understood to imply a morbid condition causing the extravasation of blood, independent of any acute specific disease. In other cases, the hæmorrhage is more extensive and different parts of the body present bruises which pass through the various tints of blue, green, and yellow, as the serum of the blood is absorbed and changes take place in the hæmatin. The gums are often spongy and bleed continuously. This is termed "*purpura hæmorrhagica.*" Typhus is specially called the petechial fever from the general character of its eruption.

Causes.—Children sometimes suffer from this affection who live in squalid homes and are badly and insufficiently fed. The worst case I ever saw followed typhoid fever accompanied by uncontrollable epistaxis and copious bleeding from the bowels and kidneys. The disease may be seen in some cases of rickets, rheumatism, heart disease, leucocythemia, albuminuria, phthisis, malignant forms of scarlet fever, measles, and smallpox. The administration of hydrate of chloral in large doses and iodide of potassium have produced the affection. The immediate cause appears to depend on poverty of blood, and a delicacy of the blood-vessels, so that they rupture under arterial pressure.

Prognosis.—The disease is seldom fatal, unless it is accompanied by severe epistaxis, or hæmorrhage from the bowels. In fatal cases, extravasation of blood may be met with in the cavities of the pleura, pericardium, and peritoneum.

Treatment.—This consists in absolute rest in bed, if bleeding is going on, when gallic acid, ergot, or turpentine may be required. In severe cases of epistaxis, the nares will require the insufflation of tannin, or plugging. Milk, underdone meat, beef juice, and green vegetables are the proper forms of nourishment. Lemon or lime juice should be prescribed.

Hæmophilia (*hæmorrhagic diathesis*) is a hereditary disease characterised by immoderate bleeding and swelling of the joints. It is by far more common in males than in females, the proportion according to Dr Wickham Legg being about eleven to one. Boys inherit the disease through their mothers, and instances are rare where the fathers transmit it to their sons. Jews are very liable to the affection.

Symptoms.—These begin during the first year or two of life, and the bleeding occurs from the most trivial causes. A physical examination detects nothing wrong in the chest or abdomen. The bleeding takes place from the skin, the mucous membranes, into the subcutaneous tissues, and cavities of the joints, particularly the knee. Epistaxis is the most common form of hæmorrhage. The most severe case I have seen followed the extraction of a tooth; it may also happen from division of the frænum linguæ, leeching and vaccination. The loss of blood is sometimes so large in quantity that death has followed in a few hours.

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Prognosis.—From the liability of severe hæmorrhage there is risk to life at any time. With great care in the opening of abscesses, the extraction of teeth, &c., the ordinary term of life may be reached if the general health can be maintained. The joint affection is tedious, and often attended with pain and febrile disturbance.

Treatment.—All remedies fail to exert any decided influence over the disease. The tincture of the perchloride of iron is the best remedy among drugs. Warm clothing, good food, and a mild climate are to be recommended. If life is threatened, transfusion or the intravenous injection of saline fluid may be adopted. The joint affection requires rest and splints.

Scurvy is a very rare disease in childhood, but it is occasionally caused by a scorbutic regimen when farinaceous food in place of meat, vegetables, eggs, and milk have been long indulged in. The disease is alluded to under acute rickets, with which it is sometimes associated (see page 675).

Anæmia.—The composition of the blood is perpetually undergoing alterations, due to differences in the nature and quality of the food that is consumed, and to the changes that ensue in the functions of assimilation and digestion. Liable, then, as this fluid is to alteration, it may abound, or be deficient, in one or more of its elements. There may be an excess of blood (*hyperæmia*) or a deficiency of blood (*anæmia*). It is with the latter condition that we have now to deal.

Anæmia, or spanæmia, may be defined as a state of the system arising: 1. From deficiency of the volume of blood itself; 2. From diminution of the red corpuscles. The albuminous constituents are also more or less deficient, and the proportion of water is increased. The blood is pale and of low specific gravity; it coagulates slowly and imperfectly, and not at all in aggravated cases. This morbid state occurs sufficiently often among children to justify special notice. It may be termed "*Simple anæmia,*" or bloodlessness, there being in other respects no actual disease.

Anæmia may be divided into: 1. *Active or acute anæmia*, where the volume of the blood is lessened; 2. *Chronic anæmia*, where the red and white corpuscles are deficient, as well as the solid constituents of the blood in general.

1. *Acute anæmia* is the condition which results from violent epistaxis, or when severe hæmorrhage occurs from wounds, ulcers, mucous membranes, or internal organs; or it supervenes in the course of an acute disease.

The *symptoms* are those of syncope, the weakened heart being insufficiently stimulated to action by the diminished quantity of blood passing through its cavities. There is extreme pallor of the face, feeble or suspended respiration, cold, clammy skin, and a thready pulse. After a time the patient may show signs of rallying, and the features assume a brighter look; the skin becomes warmer, the pulse returns, he stares about as if in bewilderment, and sighs deeply, or is sick. If he attempt to walk before reaction is established the faintness returns, and in grave cases where the hæmorrhage has been profuse, the face becomes paler and ghastly, the extremities are cold, and the pulse cannot be felt. The patient is incessantly restless, tossing about in bed from one side to the other, unable to swallow, and incapable of being roused. Convulsions ensue, followed by coma and death, if the loss of blood continue. After death in these cases the cavities of the heart are found contracted and empty, and the lungs and internal viscera are pale.

The *treatment* consists in placing the patient in a recumbent posture, with the head low, as in the management of syncope, and in endeavouring to restore the warmth of the surface by friction, and the internal use of stimulants, such as wine, brandy, or ammonia, if the patient can swallow. A mustard poultice applied over the cardiac region, and to the calves of the legs, will be sometimes necessary. To moderate nervous excitement, and to subdue restlessness and delirium, opium may be needed, either in one full dose, or in smaller doses, repeated according to the discretion of the practitioner. Where the patient is unable to swallow, brandy or beef tea may be thrown into the rectum.

Chronic anæmia may result from the acute condition, but it more frequently steals on gradually from chronic diarrhœa, fevers, albuminuria, tuberculosis, scanty food, and a deficiency of light and air. When children are confined to unhealthy dwellings, which abound in London and large towns in general, they often present a striking contrast to those who are reared in the pure air of the country. A condition of chronic anæmia is often observed in children who are naturally delicate, or who, after being reared in the country for the first few years of their lives, are transferred to London, or some other large city, and are placed at school in crowded rooms, and in an impure atmosphere.[*]

The *general* symptoms, which may have come on in the most gradual and imperceptible manner, are great pallor of the skin, mucous membranes, gums, and conjunctiva. The ruddy complexion of health has departed, and the fine network of capillaries is no longer visible. There is debility, loss of appetite, and exhaustion, with a tendency to faint after excitement or slight illness. The heart is agitated, and palpitates on the least exertion or excitement; the impulse is diffused, and appears to strike against the hand very suddenly, whilst the apex beat can often be recognised outside the nipple line; and the aortic valve sound is sharp and abnormally clear. The pulse is small and weak from deficiency of blood, and exertion or fatigue increases its frequency at once; the tongue is extremely pallid, and usually smooth, but in some cases it is slightly furred, flabby, or even œdematous, with indentations along its sides, caused by contact with the teeth. The carotids pulsate strongly, the bowels are torpid, and the urine is copious and pale. Epistaxis is not uncommon and petechiæ are sometimes observed. Intercostal neuralgia and pain over the cardiac region are frequent, as well as a sense of heaviness and weight in the limbs; there is headache, chiefly affecting the forehead and vertex in many cases.*

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[*] Even "in that temperament which when exaggerated becomes anæmic," as Dr Carpenter remarks in his 'Principles of Human Physiology,' "there is a marked diminution of the corpuscles, the number contained in a cubic centimètre falling from 5,000,000, which is the normal amount, to about 2,000,000." This reduction affects the red corpuscles, for the white corpuscles and fibrin are unaffected whilst the water is increased.

When extreme anæmia in children is attended with loss of flesh and symptoms of general cachexia, there are grounds for the suspicion of tubercle, and very often disease of the mesenteric glands, even in the absence of fever and cough. The bloodless condition and waxy tint of these children encourage the idea that some organic lesion has arisen, and what so likely to complicate the anæmia as the tubercular dyscrasia?

Three kinds of murmurs may be heard in anæmia. 1. Cardiac murmurs. 2. Arterial murmurs. 3. Venous murmurs.

The *physical* signs detected over the cardiac region, and the great arteries and veins of the neck, are probably owing to the normal relations being destroyed between the blood and the muscular tissue of the heart; the former being thin and deficient in red corpuscles, and the latter having become flabby and lost its tone. The murmurs heard are "blood sounds," and do not actually owe their existence to any obstruction in the course of the circulation.

The most frequent cardiac murmur is that heard over the pulmonary artery, coincident with the heart's systole. It is soft, of low pitch, and localised over the second and third left intercostal spaces, where the cartilages join the sternum. The artery, at its origin, is superficial and near the sternum, so that the sound is easily heard when the blood passes through it. A deep inspiration, which fully inflates the lung, and elevates the chest wall, may cause the sound to disappear, but pressure with the stethoscope over the vessel, whilst the patient holds his breath, will increase its intensity. I have seen two or three instances where the lung was retracted in adults, and the murmurs, which were loud, disappeared when the lung was fully inflated on a deep inspiration.

Similar murmurs can be heard over any of the heart's orifices in extreme anæmia in children and delicate persons—in the course of the aorta, and throughout the cardiac area, or even the entire sternum, but they are generally loudest at the base of the heart, and are single, soft, and blowing. This single murmur is readily transmitted through the walls of the heart, when its muscular tissue is relaxed, and the blood is impoverished and thin.

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* See chap. i, "On the Headache of Cerebral Anæmia," 'On Headaches,' by W. H. Day, M.D., 3rd edit., 1880.

The *bruit de soufflet* (bellows murmur) is an endocardial murmur, and is usually considered diagnostic of organic change. When very soft, and occurring even at the apex in anæmic subjects, it may be simply the expression of debility and relaxation of the mitral orifice without any roughness or contraction of the valves guarding the aperture of the heart. Although opinions are not unanimous on the mode of production of this murmur, it is sometimes heard in children who are anæmic, and whose blood is so watery that it is readily thrown into vibration as it passes along the vessels. If deterioration in the quality of the blood can lead to arterial and venous murmurs, we are bound to accept this as a reasonable explanation in some cases.

Over the large arteries in the neck, and synchronous with the pulse, another soft, single, intermittent blowing murmur is heard when the stethoscope is applied. These murmurs are common after great losses of blood, but no exact conclusions can be drawn from them alone.

In severe cases of anæmia, where the blood is much changed and attenuated, there may be heard over the jugular veins, just above the clavicles, and especially over the right jugular vein, a continuous hum or "humming-top" sound (*bruit de diable*), as the French call it). According to Dr Gee, pressure with the stethoscope will produce the murmur in a certain number of cases, but a venous hum in chlorotic persons is independent of pressure, and is due to the anatomical relations of the parts concerned.*

When these symptoms continue for a long time, and the heart is perpetually agitated, some dilatation of its walls is apt to ensue. Among children, the heart's area is frequently increased without murmur, but in long-standing cases the increased impulse, which is sudden and slapping, may eventually lead to hypertrophy, the stroke of the heart after a time becoming longer and heaving. Although this morbid state is not so frequent among males as females about the time of menstruation, it is sometimes met with in boys who are brought up in unhealthy homes, breathe bad air, and are deprived of proper food.

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* 'Auscultation and Percussion,' 1877, p. 182.

The *diagnosis* of blood-murmurs from those due to organic change may be briefly summed up as follows. In the former case, as we have seen, anæmic murmurs are either arterial or venous; they are chiefly heard over the base of the heart, and at the pulmonary orifice; and although we cannot state positively the causes on which they depend, we are probably right in supposing that the very soft character of the murmur precludes any likelihood of a roughened or constricted aperture, which is known to produce a rough, grating, musical or prolonged murmur over the situation of particular valves. The presence of a diastolic bruit also would indicate valvular disease. When the murmur is soft and blowing, and is diffused over the entire cardiac region, fading in intensity towards the apex, it is due to blood change; when it is localised over one or more of the heart's orifices, and cannot be detected above the third rib, it is presumably due to organic change. Irregular action of the heart, feeble pulse, congestion of the lungs from regurgitation through the mitral orifice, blueness of the fingers, and hypertrophy following rheumatism, also point to organic change.

The following is an excellent example of chronic anæmia of a most severe type, lasting a long time without any real change for better or worse:

G. W—, æt. 9, was admitted into the Samaritan Hospital under my care on October 4th, 1877. He came of a delicate family, and his mother was highly nervous. The house in which he resided was said to be unhealthy, it was very small, and situated immediately above stables. He began to droop two months before admission, complaining of pain, either in his head, chest, or side. The boy presented on admission a yellowish, waxy pallor, with dark eyelids and bloodless lips, the gums and conjunctivæ were very pallid, the pulse was quick and small, the temperature was normal. The heart's area was increased, and the apex beat was below and to the left of the nipple, so that dilatation most probably existed to some extent. A soft murmur was heard over all the orifices of the heart, weakest at the apex, and loudest below the left clavicle. The murmur was not audible at the back. A venous hum in the neck was very distinct. The percussion note was not so clear under the right clavicle as the left, and expiration was longer on both sides than in health, which is by no means uncommon in states of debility. The liver was of full size, but no enlarged glands could be felt through the abdominal walls, nor in the neck.

A mixture containing the ammonio-citrate of iron and Fowler's solution was given three times a day, and milk, eggs, and beef tea prescribed as the patient's diet.

On the 30th, without any ascertainable cause, he became very feverish, and between 6 p.m. and 12 p.m. the temperature fluctuated between 102·6° and 104·0°; the pulse reached 134; the skin was burning hot and dry; he complained of pain in his abdomen, was sick, and wandered when he slept; next day the temperature fell to 100·2°, and two days later it was normal.

Mr Alban Doran examined the blood and found it deficient in red corpuscles, but the white corpuscles were not in excess, nor were they large, nor unusually granular.

On the 15th of November it was recorded that the least thing agitated and excited the patient; he became sick without cause, and a full meal sent up his temperature two or three degrees. Fifteen minims of the Liquor Ferri Dialysati were ordered in a tablespoonful of water three times a day.

On the 23rd, the report states that his anæmia was extreme, he had a chlorotic tint, the gums, lips, and mucous membrane of the mouth and conjunctiva being absolutely colourless. There was no confusion of ideas, giddiness, or headache. He had a little hacking cough, with some whistling rhonchi over the front of the chest, but no dulness. The temperature had averaged 98·4° during the preceding three weeks. For some days he had been taking half a pint of milk, beef tea, eggs, and two ounces of port wine daily. He was now ordered to take half an ounce of essence of meat three times a day, and the solution of iron to be increased to twenty minims for a dose.

December 21st. He had improved in strength and general appearance. His friends took him home.

Readmitted February 26th, 1878, feeling ill with severe headache and exhaustion; Temp. 103°, pulse 128, resp. 40. The murmurs were louder over the heart and cervical vessels. The heart was tremulous and the apex beat external to the nipple line. There was no enlargement of the spleen, liver, or lymphatic glands. He had not lost more flesh. Cold sponging was ordered to reduce the febrile condition, and a grain of quinine was given three times a day. In five days, the temperature was normal.

March 4th. A phosphorus capsule, containing gr. 1·30, was ordered daily after the mid-day meal. Orange juice with milk was also prescribed.

9th. He took his food better, and the pulse fell to 96, but he had a vitiated appetite, desiring the most indigestible and unwholesome articles of diet. When he remained in bed he was tolerably well, but when he got up and walked about he was ill from the fatigue and excitement. He weighed 3 stone 3 lbs.

Two ounces of cod-liver oil were ordered to be rubbed into his body daily, and reduced iron and pepsine to be taken in a powder, three times a day.*

A pint of supercarbonated Schwalbach water was ordered daily.

May 14th. He improved for a few days, and then became worse again—he had been occasionally sick, but the temperature was normal. He had lost four pounds in weight since last report. There was dulness and harsh breathing below the left clavicle. The dulness was more perceptible over the left supra-scapular ridge; below this and between the inner border of the left scapula and spine the respiration was sniffling and tubular. The appetite was poor, the pulse quick and agitated, the face more angular, and there was cough. The asthenia was so great, and the child so exhausted, that an attack of diarrhœa or inability to take food might have induced dangerous syncope.

October 22nd. He went to Kingston-on-Thames in June, 1878, and stayed there two months. He had resumed school, and although very pale, there was some return of colour in the lips, and he had gained in flesh. The harsh breathing below the left clavicle had departed, but the cardiac and cervical murmurs were the same.

Fatal cases of simple anæmia sometimes occur in which no evidence of disease can be found after death. The internal organs are pallid, and in some instances there may be slight effusion into the serous cavities, or subcutaneous tissues. Wilks and Moxon state that the blood resembles pink water in these cases, and that no coagula are formed in the vessels or heart. The latter organ is in that form of fatty degeneration, where a peculiar mottling of the muscular fibre takes place, especially in the left ventricle.†

The *treatment of chronic anæmia* will depend upon the cause and the condition of the patient. If the strength is much reduced, and the heart weakened, we should keep the patient as much as possible in the prone position till he has regained a little strength, and the heart is steadier. If this precaution be not observed, there is the possibility of frequent faintings, and even fatal syncope, when the disease has been of long standing, and the nutrition of the heart has suffered.

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* Form 94: ℞ Ferri Redacti
Sacchar. pur.
Pepsinæ Porci, āā gr. ij. M.

† Op. cit., p. 636.

Suitable food of a nourishing and digestible character should be given frequently, and in small quantities at a time. It may be necessary to prescribe an aperient of rhubarb, or liquorice powder to stimulate the bowels, and some stomachic to assist digestion before the usual remedies are employed to restore the blood to a healthier state. Fresh air and moderate exercise accelerate recovery.

Foremost in the list of remedies are preparations of iron.* They have an astringent, a stimulating, and a tonic action; some are irritating to the mucous membrane of the stomach, causing pain and uneasiness when it is weak, and others are easily soluble, producing no unpleasant effects. It is, therefore, very important to make a careful selection when any salt of iron appears to be indicated. In the anæmia of which we have been speaking, the ammonio-citrate of iron is one of the best remedies. It scarcely ever disagrees, and may be continued for weeks together with the best results. It produces neither pain, constipation, nor sickness, and is about the best blood restorer we possess in simple anæmia. It may be given in syrup and water, with or without a grain of carbonate of ammonia (Form. 95).† This is a good combination when the child is depressed and languid. When there is great debility, characterised by a hæmic murmur over the base of the heart, and the tongue is flabby and indented by the teeth, the tincture of the perchloride of iron with glycerine is an excellent tonic (Form. 96).‡ Half a grain, or a grain, of quinine may sometimes be advantageously added to each dose of the mixture.

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* "Iron possesses the power of augmenting the number of the blood-corpuscles as well as increasing the hæmoglobin. This is perfectly effected, according to Dr W. R. Gowers, by the chloroxide of iron (dialysed iron). In the course of five weeks under the use of this remedy the corpuscles increased greatly in number, followed by recovery of the patient, who suffered from pallor, shortness of breath, and giddiness on exertion."—*The Numeration of Blood-Corpuscles*, 'The Practitioner,' July, 1878, p. 10.

† Form. 95:
℞ Ferri et Amm. Citr. gr. xvj
Amm. Carb. gr. viij
Syrup. ʒiij
Aquam ad ℥iv.
M. A dessertspoonful three times a day.

‡ Form. 96:
℞ Tinct. Ferri Perchlor. ♏xl
Glycerini ʒiij
Aquam Cinnamomi vel Carui ad ℥iv.
M. A dessertspoonful three times a day.

There are other forms of iron which children take readily enough, and as it is advisable to change the preparation from time to time where the blood remains impoverished long together, we possess valuable remedies in the syrup of phosphate of iron, the syrup of hypophosphite of iron, Parrish's chemical food, steel wine, and the syrup of the iodide of iron. Iron lozenges (*Troch. Ferri Redact.*) will be found useful in some cases after the chief meals of the day. They are tasteless, and the mode of administration is most convenient. One grain of reduced iron is considered by Messrs Squire to be equivalent to five grains of citrate of iron.[*]

Easton's syrup (Syr. Ferri Phosp. et Quinæ et Strychniæ) is a useful preparation in those cases where there is much nervous depression and want of tone.

In those cases of anæmia where children have not lost flesh, but are puffed and flabby, the muscles soft, and the bowels torpid, a mixture containing a few grains of sulphate of magnesia with sulphate of iron, or the solution of the perchloride (Form. 97),[†] will sometimes rouse the digestive functions, regulate the bowels, increase the appetite, and prove highly beneficial.

Belladonna may be given with the tincture of the perchloride of iron when the action of the heart is quick and fidgety. It is of benefit in two ways, it reduces the frequency of the heart's beats, by which it has time to gain tone, and it probably has the effect of counteracting the constipating effects of the iron (Form. 98).[‡]

The supercarbonated Schwalbach water is an excellent chalybeate tonic, improving the quality of the blood in these states of anæmia, and exercising a beneficial influence over the digestive and assimilative functions. For hospital purposes, however, it is too expensive.

Pernicious or idiopathic anæmia is a disorder first described by Dr Addison in 1843. I may refer to it in this place, partly because it is a form of anæmia which relatively speaking is acute, partly on account of cases being recorded among children. Moreover, it has recently occupied much attention. Dr Addison termed it "*idiopathic anæmia*," Biermer called it "*progressive pernicious anæmia*." Practically it may be described as a disease where anæmia sets in without any appreciable cause, and is unattended by glandular or visceral disease, or even by loss of flesh. It progresses rapidly, and destroys life in from six to twelve months, and is most rapidly fatal in young subjects. It is, however, usually observed in patients past the middle period of life. Dr Stephen Mackenzie, in an interesting lecture on the subject, describes a case of idiopathic anæmia in a schoolboy aged 10, who died five months after the onset of the symptoms. At first he became white, "like wax," and the pallor rapidly increased, with great perspiration, giddiness, and chilliness. Admitted into hospital two months and a half before death, he was found to have optic neuritis, and a systolic murmur loudest at the apex. His blood contained very pale red corpuscles, some of which were not more than a quarter of the usual size, and of these some were tailed. There was no increase of white blood cells. He died, after several attacks of uncontrollable vomiting, epistaxis, and bleeding from the gums.*

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[*] 'Companion to the British Pharmacopœia,' 11th edit., 1877, p. 143.

[†] Form. 97:

℞ Magnes. Sulph. gr. xvj
Acid. Sulph. dil. ♏iij
Ferri Sulph. gr. iv
Vel Tinct. Ferri Perch. ♏xl
Syr. Zingib. ʒij
Aquam Carui ad ℥iv.
M. A dessertspoonful three times a day.

[‡] Form. 98:

℞ Tinct. Belladonnæ
— Ferri Perch. āā ♏xl
Spt. Chloroform ♏xvj
Glycerini ʒiij
Aquam ad ℥iv.
M. A dessertspoonful three times a day.

For children from five to ten years of age.

A case of idiopathic anæmia is recorded by Sir Wm. Gull, in which he states his belief that "the line of morbid action seems to be through the nervous system interfering with the functions of digestion, or, more generally speaking, of hæmapoiesis."† I think this view is in a great measure the correct one, looking at the high temperature which is so often noticed in children, the subjects of confirmed anæmia, after food, fatigue, or excitement, changes in the weather, and so forth.

The *prognosis* is most unfavorable, the disease usually terminating in death.

Treatment.—A highly nutritious dietary should be ordered, with a little alcohol in the later stages. Benefit will result from the employment of iron, and in some cases, of arsenic. A combination of these drugs in a mixture is perhaps the best form of medication. Theoretically, one would expect better results from the transfusion of blood than are met with in practice; doubtless, it is, that temporary improvement, at least, follows transfusion. Dr Meldon records four cases of pernicious anæmia cured by the intravenous injection of milk.

Simple enlargement of the cervical lymphatic glands along with

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* 'The Lancet,' vol. ii, 1878, pp. 797–833.

† 'Trans. Path. Soc.,' vol. xxix, p. 383.

anæmia occurs so often in delicate and strumous children, that some special notice is needed of its nature. The complaint is exceedingly common in hospital practice. Cold, impaired health, and the irritation arising from the exanthemata, and particularly scarlet fever and diphtheria, excite the lymphatic vessels, and cause the glands to inflame and swell. The hyperplasia is inflammatory, the cell elements and connective tissue being increased. The glands so affected may remain for an indefinite time enlarged and tender; then they gradually shrink, and resolution takes place, if the general health and constitution are good. They sometimes give rise to neither pain nor inconvenience of any sort. They occur to children in fair health, who get an occasional sore throat, the swelling subsiding in the course of a few days. If the child is delicate, and comes of a strumous family, we speak of "scrofulous" enlargement, so common in the out-department of our hospitals. A gland swells, and remains enlarged for some time; then another gland, or, indeed, several glands, become implicated, the morbid process spreading from one to the other, and suppuration occurs in them one by one, till they either ulcerate and discharge a caseous kind of pus, or it may be considered advisable to open them. In either case a puckered and ugly scar remains for life. When the suppurating glands are not opened by the surgeon, it sometimes happens that the matter within becomes absorbed, leaving a hard concretion in the neck. These enlarged glands may be seen sometimes in children who are tuberculous, showing no tendency to suppurate. It is in such cases as these that the cervical glands remain large, uneven, and irregular in shape, without any tenderness or discoloration of the skin. They are freely movable and non-adherent. The glands usually affected are the cervical, inguinal, axillary, and mesenteric. In the neck they are often found inflamed and tender from sore throat, dentition, and catarrh.

The *treatment* varies with the condition of the gland. When the enlarged glands have passed into a chronic and indolent state, they are very obstinate in yielding to any method of treatment. If the source of irritation can be ascertained, it should be, if possible, cured or removed; as eczema of the scalp, decayed teeth, &c. Then we may proceed to deal with the enlarged glands. The application of a weak solution of tincture of iodine night and morning, or slight friction with iodine ointment, are common and useful applications. I greatly prefer the former. When suppuration threatens, a poultice is necessary, and as soon as fluctuation is detected, a small opening should be made horizontally with a lancet, which will often accelerate the cure, and cause the abscess to contract. But if matter threatens to burrow, the abscess must be laid open freely. The constitutional treatment consists in prescribing good food, syrup of iodide of iron, phosphate of iron, cod-liver oil. Above all, children suffering from these chronic glandular affections should have the benefit of sea air if it can be obtained.

Enlargement of the thyroid gland (*bronchocele*) may be now and then seen in young children. The swelling is neither painful nor tender, and rises and falls during deglutition. The general health is unaffected. One lobe may be more involved than the other. Sometimes cysts are developed in the structure of the gland. Such a case is recorded in a boy of twelve, which had lasted four years. Injections of iodine failed to reduce the swelling. A seton of thick silk passed through the tumour effected a complete cure in three months.* Strict search should be made to ascertain whether other lymphatic and ductless glands be not enlarged.

Lymphadenoma (*Hodgkin's disease*) is allied to leukæmia. It may be described as a morbid affection of a scrofulous character, attended with great enlargement of the lymphatic glands, and a peculiar deposit in the Malpighian bodies of the spleen. There is either a new growth or hypertrophy of the normal lymphatic tissue. In a histological point of view it resembles leukæmia, but it differs from it in that there is no excess of white corpuscles in the blood, and from tubercle, in having only a slight disposition to undergo the like degenerative changes. But it may ulcerate and become the seat of hæmorrhage, or fatty change, or caseation. Suppuration, which, as we have already seen, is so common in the idiopathic or simple inflammatory enlargement of the cervical glands in young strumous subjects, with which affection lymphadenoma is anatomically allied, does not occur.

The lymphatic glands increase rapidly in size, forming tumours of brain-like consistence, elastic, of a whitish-yellow colour, and adherent in masses. The disease involves the lungs, liver, kidneys, stomach, muscles, bones, and subcutaneous tissues, in which a new growth of lymphatic tissue is either infiltrated through them, or deposited as a mass or tumour in the substance of these different organs.

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* 'The Lancet,' 1882, vol. ii, p. 488.

Another characteristic feature of the disease is the effect it sometimes produces on the blood, the red corpuscles being diminished and the white increased, so that in such a case lymphadenoma may be said to produce leucocythemia.

The disease commences gradually in the lymphatic glands about the neck, and after a time it spreads and involves other organs in a similar morbid process. It is associated with failing health and cachexia, and it pursues the same fatal course as malignant growths generally, with which it has a close and intimate connection.

"A case of rapidly fatal lymphadenoma" is described by Dr Garlick.* A male child, aged seven, was admitted into the Hospital for Sick Children, Jan. 5th, 1878. There was a family history of phthisis and struma. A large mass of glands appeared on the left side of the neck two months and a half before death, with rapid deterioration of health; at the last, there was asthenia, dysphagia, occasional dyspnœa, and diarrhœa, with high temperature. On a post-mortem examination, twenty-five enlarged and vascular cervical glands were seen on the left side of the neck, the tracheal and bronchial glands were enlarged, and there was a large vascular lymphatic gland in the hilus of the kidney; in the spleen enlargement of the Malpighian bodies from new cell growth in the sheaths of the vessels; in the liver lymphoid growths, the largest the size of a hemp-seed, the adjacent liver cells in a state of fatty degeneration.

Another case of interest is described by Mr Macnamara.† "A fair-haired, blue-eyed, intelligent lad" had been admitted into the Stepney Sick Asylum. The general health was good till June, 1878, when rapid enlargement of the right cervical glands commenced. There was a history of hereditary tuberculosis. On admission into hospital, the glands on the right side of the neck felt like a firm sarcomatous growth, with here and there soft patches. The glands were also enlarged on the left side. There was neither albuminuria, dropsy, nor leucocytosis. Pleurisy came on soon after admission, and he sank from impeded respiration, and effusion into the pleura, five months after the commencement of the symptoms. After death, all the lymphatic glands in the body were found to be hypertrophied; yellowish-grey nodules were found on the surface of the liver, spleen, and base of both lungs. Mr

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* 'Trans. Path. Soc.,' vol. xxix, p. 355.

† Ibid., vol. xix, p. 360.

Macnamara detected remarkable changes in the medulla and periosteum of the bones.

Mr Alban Doran gives me the following particulars of a case which he closely observed when house-surgeon to Mr Holden, at St Bartholomew's Hospital, the subject being a boy, A. P—, 11 years of age. At Christmas, 1872, a tumour began to appear on the right side of the neck, below the lower jaw. It rapidly grew larger. When admitted into the hospital on June 10, 1873, there was a great mass of enlarged glands on the right side, from the chin to the sternum. The whole growth felt lobular, firm under the jaw, soft in the middle, and at the lowest part was a fluctuating projection the size of a marble. The skin over the tumour was red, and a week after admission it became adherent to the glands, though when first examined it was quite free. Considerable enlargement of the upper cervical glands on the left side existed. One gland in the right axilla was enlarged. There was impaired resonance and feeble respiration over the front of the left lung. No enlargement of the liver could be detected, nor was there any preponderance of white cells in the blood. On applying a trocar to the lowest part of the tumour on the right side of the neck, chocolate-coloured fluid escaped, consisting of red corpuscles with numerous white blood-cells. The tumours rapidly increased; for two nights (June 28th and 29th, 1873) he suffered from dyspnœa. Late in July the tumour on the right side ulcerated, and hæmorrhage followed, checked by cold. This tumour at length sloughed away, the patient became extremely emaciated, and died on Sept. 10th.

Post-mortem examination.—The tumour on the right side was reduced to a flaccid bag of sloughs extending from the zygoma to the clavicle. The tumour on the left side was smaller, the upper portion resembled on section an ordinary enlarged gland, the remainder was softer, very vascular, and deep red. The bronchial glands and one mesenteric gland presented the same appearance, being red, and almost pulpy. The spleen was very pulpy, the size of a small orange, and deeply lobulated. The glands in the transverse fissure of the liver were pale and slightly enlarged; the heart, lungs, liver, and kidneys were normal, but the left kidney was indurated by the enlarged spleen, and slightly congested. There was intussusception of about two inches of ileum.

The treatment consisted in the administration of cod-liver oil, and ferruginous tonics. Dr Gowers relates two cases where the blood corpuscles in this disease increased 20 per cent. during the administration of phosphorus.[*]

Leucocythemia (*Leucocytosis—Leukæmia of Virchow*)[†] is occasionally met with in children. It is a peculiar disease of modern discovery, consisting of an increased number of white corpuscles in the blood, and the formation of a new lymphatic tissue in the spleen, lymphatic glands, liver, kidneys, and various other organs of the body.[‡] Dr Green considers it probable that the power of the white blood-corpuscles and lymph-corpuscles to form red corpuscles is diminished, and that the white corpuscles may possibly increase by multiplication in the blood.[§] The disease is unconnected with inflammation, but sometimes associated with tuberculosis, Bright's disease, and cancer. It has been estimated by some writers that the proportion of red and white corpuscles is about the same, the red being arranged in rouleaux, and the white filling up the spaces between them. Many of the white corpuscles are larger, more granular, and contain a single, a double, or a treble nucleus.

The constitutional symptoms of leucocythemia vary in severity; they are, extreme pallor and cachexia, a blanched conjunctiva, languor, on exertion, frequent vomiting, thirst, diarrhœa, or constipation. There is generally enlargement of the spleen, liver, and lymphatic glands. There may be œdema of the lower limbs, or ascites, and owing to the changed state of the blood, epistaxis, and bleeding from the gums sometimes happen. The urine is often loaded with lithates. When the liver is enlarged at an early stage there may be jaundice. Dr Greenfield describes a case of leucocythemia in a female child, aged four and a half, which proved fatal. The leading symptoms were extreme pallor, and large bruised-like spots appeared on the limbs. After death, extensive infiltrations of leucocytes were found in the liver, kidneys, and heart. In this case, however, there was a distinct history of syphilis in the father and mother, with the ordinary hereditary symptoms in the patient herself.*

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[*] "The Numeration of Blood-Corpuscles," 'The Practitioner,' 1878.

[†] As pointed out by Dr Hughes Bennett and Dr Parkes, Leukæmia ("white blood") is not a good term, because if the blood be drawn from the arm it is red. Leucocythemia; λευκὸς, white, κυτος, cell; and αἱμα, blood—white cell blood, expresses the true pathological fact, viz. that the blood abounds in colourless corpuscles. 'Principles and Practice of Medicine,' by J. Hughes Bennett, M.D., 1857, p. 858.

According to Dr Michael Foster the white cells in leukæmia are in the proportion of one to ten red.

[‡] "Next to the spleen, the liver is most commonly found diseased in leucocythemia." Ibid., p. 873.

[§] 'Pathological and Morbid Anatomy' 1871, p. 140.

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* 'Trans. Path. Soc.,' vol. xxix, p. 298.

CHAPTER LII

DISEASES OF THE EAR

Frequent in childhood—Peculiarities of the ear in childhood—Catarrhal deafness—Its relation to coryza, tonsillitis, &c.—Evil effects of obstruction of the Eustachian tube—Treatment.—OTORRHŒA—*Its causes—Case illustrating extreme results of suppurative inflammation of tympanum, &c.—Diagnosis.*—AURAL POLYPI—*Frequency of perforation of membrana tympani—Examination of the ear—Detection of perforation—General and local treatment—Injections—Management of perforation—Artificial membrana tympani.*—ECZEMA OF AURICLE.—ABSCESS OF MEATUS.—*Causes and treatment.*

Two diseases of the organ of hearing are so far more frequent in childhood than any other disorder of the ear, that they should be described before all others. These diseases are catarrhal deafness and otorrhœa.

The middle and internal ear is very similar in childhood and in adult life, owing to the early development of its structures. The three little auditory ossicles are almost full-grown at birth, so that the stapes of an infant is very little smaller than that of a giant trooper in a Guard regiment.

On the other hand, the outer bony structures of the ear are very different at birth to what they are in youth and in the adult stage. There is absolutely no bony external meatus, but a mere ring of bone in the new-born infant, destined to enlarge externally so as to form that osseous canal. Hence, in very young children the membrana tympani is much nearer the surface than in adults. The plane of that membrane, too, is nearly horizontal, so that it lies almost level with the base of the skull, as may be seen on examining the under surface of a fœtal skull.

The membrana tympani cuts off the external meatus from the cavity of the tympanum. This membrane is vascular, and readily conveys inflammation from one side to the other. Hence the frequency of inflammation of the tympanum when its external membrane has inflamed from cold, damp, or some injury on its outer aspect. The tympanic cavity communicates with the pharynx by the Eustachian tube, and is lined by mucous membrane. That canal is opened during every act of swallowing. The sound of air rushing into the tympanic cavities can be recognised as two simultaneous clicks, during the act of swallowing a little water, and this becomes more manifest when the nose is closed. The presence of air on the inner as well as the outer side of the membrana tympani, is absolutely necessary for the exact transmission of vibrations. It is doubtful whether the air in the tympanum be of the same density as the external atmosphere.*

Frequent attacks of acute coryza, or of sore throat, so common in childhood, cause thickening of the mucous membrane of the Eustachian tube, which thus becomes obstructed. Simultaneous enlargement of the tonsils generally exists, but this complication does not much increase the defect of hearing. The child complains of a heavy feeling in one or both ears, and becomes decidedly deaf. Incipient deafness is often mistaken for dulness of intellect or wilful inattention to the commands of a teacher, and so the poor child is unfairly ridiculed or punished. From the tubes the inflammation extends to the tympanic cavity. Pain in the ear then becomes frequent, and through exposure to damp, the mild inflammatory stage assumes an acute form, with increase of suffering. The blocking of the Eustachian tube causes great external concavity of the membrana tympani, owing to atmospheric pressure being greater without, than within the tympanum. This may permanently damage the membrane.

All these common forms of "*catarrhal deafness*"—whether due to chronic inflammation of the Eustachian tubes, or to chronic, or subacute inflammatory processes going on within the tympanum, may come under the notice of the physician. Some of the most necessary curative measures—particularly for inflation of the Eustachian tubes—must be left to the surgeon. But the same general and local measures that are of benefit in tonsillitis and coryza will be required when the mucous membrane of the auditory apparatus is involved. Without them, surgical interference will, at most, ensure only temporary improvement. Hence tonics, cod-liver oil, weak astrigent applications (as in tonsillitis), and fresh air are imperative.

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* See Keene, "On Middle-ear Deafness," 'The Lancet,' vol. ii, 1878, p. 690.

The most troublesome of all diseases of the ear in childhood is purulent inflammation of the tympanic mucous membrane, with perforation of the membrana tympani and escape of unhealthy pus by the external meatus. Circumscribed suppuration within the tympanum is very rare. An interesting case of acute otitis terminating in abscess of the tympanum, is related by Dr Moorhead, in a boy, 15 years of age. It commenced with acute pain in the left ear, the temperature rose to 102°, and the pulse to 120. Hearing was impaired, and the membrana tympani became opaque. Under the use of leeches and antiphlogistic remedies, the pulse and temperature fell to normal. The breath was very fœtid, and it soon became evident that pus which had been pent up in the tympanic cavity had found its way through the Eustachian tube into the throat. Three weeks later, the deafness being still extreme, the patient suddenly heard a loud noise in the affected ear, followed by an escape of fœtid pus through the Eustachian tube, and the restoration of hearing.*

Otorrhœa must always be regarded with suspicion; it may lead to meningitis, facial paralysis, or other grave affection.†

Otorrhœa often commences as a low form of catarrhal deafness in sickly strumous children. But it also very frequently appears as a local result of great general impairment of health after the exanthemata, particularly scarlatina and other acute diseases. Field remarks—"The mucous membrane is liable to inflammations, usually of a catarrhal kind, which are analogous with the changes seen in other mucous membranes. The most severe forms are those which are extensions of the inflammations occurring in the mucous membrane of the fauces and pharynx in diphtheria and scarlet fever; these pass along the Eustachian tube, and affecting the tympanum with the same severity they do the throat, often work terrible havoc there; for not only will they fill it with pus and produce perforation, by inflammation and over-distension of the drum-membrane, but frequently the deeper structures are also involved, so that the periosteum becomes injured, and caries or necrosis of the bony walls ensue, producing in many cases an utter destruction of the organ, if not of the individual. The perils of meningitis, phlebitis, abscess of the brain, pyæmia, and the like, are all threatening when this most severe form of disease in the tympanum occurs. We may consider it fortunate sometimes when the cavity becomes blocked with a mass of cheesy material which may become quiescent; though unfortunately remaining as a hidden danger, which at any time may develop into an active centre of infection, and cause a general tuberculosis. This form of disease is most frequently seen in young children, and it often affects both ears at once; when this happens they generally grow up as deaf mutes."*

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* 'British Medical Journal,' vol. ii, 1878, p. 313.

† See Chap. XL, p. 539, "On Meningitis."

A child of four, admitted into the Samaritan Hospital, in the autumn of 1878, with acute tuberculosis of both lungs, was found to have a discharge from the meatus on both sides, a few days after admission. Noma followed, attacking the integuments behind the ears; and after the patient's death the right petrous bone was found to have become necrosed, both tympanic cavities to be full of pus, and the ossicula quite loose. Not a trace of the membrana tympani could be found on either side. This case illustrates, in a very aggravated form, the etiology and course of otorrhœa. In ordinary cases the discharge may last for months or years, issuing through a small hole in the membrana tympani; but caries or necrosis of the neighbouring bones is, fortunately, rare.

The constant purulent or muco-purulent discharge from the meatus renders the diagnosis of otorrhœa very simple. The discharge often smells offensively when no disease of the bone exists. A copious secretion from the external meatus alone is so unusual, that a free escape of any morbid fluid from that passage implies, as a rule, perforation of the membrana tympani. This complication, or rather, this constant feature in chronic otorrhœa, is not in itself serious, as the tympanic cavity thereby becomes accessible to injections.

A purulent discharge from the meatus often gives rise to polypoid growths, and according to the author just quoted, "Polypi frequently occur in the middle ear, and are, perhaps, invariably the results of inflammation. Their structure and history vary with the severity of the inflammation, and the parts from which they spring. The most common is the ordinary mucous polypus of a similar nature to those seen in the nose and uterus. These spring from the mucous surface, and are formed of soft cellular tissue; they contain reduplications of the epithelial surface forming gland-like tubes or sacs. The surface of the growth is covered with ciliated cylinder epithelium, which changes sometimes at its extremity to a mixed or pavement epithelium. More rare are the fibromata developed from the periosteal layer." Aural polypi arise almost invariably from the walls of the tympanic cavity and may easily be removed by Wilde's polypus snare.

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* 'Diseases of the Ear,' 2nd edit., p. 221.

The existence of a hole in the membrana tympani in cases of copious discharge is indisputable from clinical evidence, and from the anatomical peculiarities of the tympanum. Matter escapes through the least resisting structures in its neighbourhood. In the tympanum the Eustachian tube and the membrane are the least resisting media for the discharge of secretions. But the tube is, in these cases, almost always partially obstructed, and the membrane, on the other hand, is softened by inflammatory changes so that it first bulges externally, then yields at one point. This perforation may for some time remain very minute, as though a pin had been pushed through the membrane, but it may be so extreme that nothing remains but a crescentic ridge or elevation at the bottom of the external meatus to mark the site of the membrana tympani.

Hinton, speaking of catarrhal inflammation of the meatus with "more or less profuse semi-purulent discharge," asserts that—"So far as I have observed, this condition is a concomitant of a similar affection of the tympanic cavity. Many cases, also of apparent catarrh of the meatus, are really cases of minute perforation of the membrane."* Von Troltsch, in reference to what he terms chronic suppurative aural catarrh, remarks very positively—"Perforation, or partial destruction of the membrana tympani, is always present in these cases."†

Enlargement of the upper cervical glands is a very general symptom of otorrhœa. More or less deafness always exists, but very irregular in degree, for it may be extreme in a mild attack, whilst it is sometimes but slight after destruction of the greater part of the membrana tympani and loss of the ossicles. It has long been a truism that, if the stapes falls out, inevitable and complete loss of hearing must follow. Still, we must remember that in all things the most experienced men are the most sparing in very positive assertions. And it is well to notice that in this matter Hinton observes—"Whether total deafness necessarily results from loss of the stapes, involving, as it must do, the discharge of the perilymph from the internal ear, is as yet undecided."[*]

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* Holmes' 'System of Surgery,' 2nd edit., vol. iii, p. 266.

† 'Surgical Diseases of the Ear,' trans. by J. Hinton, New Syd. Soc., vol. lxii.

In chronic otorrhœa, the pain is slight, as a rule, but occasionally it becomes severe, if the matter be copious, and unable to escape freely.

Diagnosis.—The muco-purulent discharge is pathognomonic of otorrhœa, but it is necessary to ascertain the amount of mischief existing in any given case. On inspecting the meatus the discharge prevents any clear view of the deeper parts. So the ear should first be syringed out with lukewarm water, and the meatus cleared by means of a piece of wool twisted on the end of a quill pen. If the membrana tympani be nearly destroyed, the tympanic cavity may then be clearly seen through a speculum, the malleus standing out boldly in relief if it has not fallen out, and the promontory will be covered with bright red granulations. But more usually, the membrana tympani can be distinguished, vascular in appearance, and showing a small perforation. Yet in many instances the aperture is so minute that it cannot be seen at first. If, whilst the medical attendant looks through the speculum, the patient be directed to make a forcible expiration with his mouth and nose firmly closed, some of the discharge will be seen issuing through the aperture. Under similar circumstances the noise of air, rushing through the perforation, may be heard when the Eustachian tube is patent, particularly if a tube be placed with one end in the patient's ear, and the other in that of the medical attendant, during the inflation of the Eustachian tube. In cases of minute perforations, invisible on first inspection, their presence may be suspected by a pulsating movement in the film of fluid covering the outer side of the membrana tympani.

Treatment.—Although otorrhœa often disappears, after lasting for years, it seldom fails to produce permanent mischief to the sense of hearing, and, besides its offensive character, the results may be serious, or even fatal.[†] Fortunately, few local diseases are more amenable to general treatment. Cod-liver oil and steel wine, judiciously administered, seldom fail to check the discharge. But this benefit is effected slowly by such drugs, so that it is always necessary to remove daily the morbid accumulation that already fills the meatus. The ear should be syringed out with tepid water several times daily, at the risk of causing occasional faintness, for the disuse of the syringe involves worse results. A little carbolic acid (1 in 40 or 50) should be added to the water when there is fœtor. After the syringing, a few drops of a weak astringent solution should be poured into the meatus. Sulphate of zinc (gr. j to v in ℥j of water with ʒj of glycerine) is very efficacious. Acetate of lead is objectionable, as it forms a precipitate in the ear. Alum may be used for a short time, but its effects must be carefully watched, as it irritates the meatus. Strong caustics have been used with great success, but the general physician and surgeon should not attempt to employ them unless he has had unusual clinical experience of ear diseases.

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[*] Loc. jam cit., p. 314.

[†] See an instructive chapter "On the Results of Suppurative Inflammation," Field's 'Diseases of the Ear,' 2nd edit., p. 136.

When the discharge is checked, the cure of the perforation may be undertaken, but not till then. The edges of the aperture should be touched, through a speculum, with a stick of nitrate of silver. If the membrana tympani be quite, or almost completely destroyed, an artificial membrane should be worn. The more simple contrivance of Yearsley—a plug of moistened wool—is often very efficacious. Its application is best performed in the way described by the late Mr Hinton.

"For the cotton wool I prefer glycerine to water, as it will then retain sufficient moisture not to need changing for four or five days; and in most cases I add to the ounce of glycerine, from five to twenty grains of sulphate of zinc. Being rolled up into a small spindle-shaped plug, about half an inch long, it may be introduced either by a pair of forceps or threaded through a narrow silver tube. I think it is best to direct whatever form of artificial membrane is used towards the upper and posterior part of the tympanum, so as to touch, if it be present, the head of the stapes. A little pain is sometimes complained of, but if the attempt succeeds well the patient is immediately conscious of hearing better, and the cotton or disc should then be left *in sitû*, and the tube or forceps carefully withdrawn. After a little instruction from the surgeon, the patient soon learns to apply it himself, and if care is taken to prevent accumulation of discharge or epidermis, the effect continues indefinitely, and often becomes, even in cases of otherwise extreme deafness, so permanent as to render the discontinuance of the wool possible."

Thus, after careful local and general treatment, otorrhœa may be cured in a few months. It is always likely to recur during childhood and adolescence, and each recurrence must be treated like the original attack. Symptoms of sudden feverishness and headache, denoting the possibility of intracranial inflammation, may come on at any stage, and require prompt surgical assistance. But this grave complication is very rare considering the great frequency of otorrhœa.

Eczema of the auricle is very common in infancy. It is an unsightly affection, and causes great irritation. It is generally associated with eczema capitis, or it may be produced by the irritation of dirt or of coarse soap, or of otorrhœal discharge. The best local treatment consists in the application of equal parts of glycerine and liquor calcis saccharatus. If very obstinate and chronic, a solution of nitrate of silver will prove beneficial. The lotion should be very dilute at first (gr. ij ad ℥j), and gradually increased to gr. x or xx to the fluid ounce. A coating of vaseline protects the sore ear from irritation when the child is taken out of doors. But all these applications are useless when the rash arises from constitutional derangement, unless alteratives be given, followed by tonics.

Abscess, or small pustules in the meatus, cause great suffering and irritation. They arise from constitutional debility, or from the irritation of injections, or the presence of dirty wool in the meatus. The parents of a child should be directed never to plug the ear except when ordered to do so by the medical attendant. They should also be reminded that the meatus must not be washed out with water, and dried with the corner of a towel forced into it. Well-intentioned mothers and nurses often produce earache, inflammation of the meatus, or blocking of that passage by accumulated cerumen, &c., by this mistaken practice. The meatus is naturally meant to be dry, the cerumen constantly falling off in fine powder. If it be moistened, the cerumen cannot escape, it accumulates and forms a moist, clammy mass. It ultimately dries, sticking fast in the meatus, so that it can only be removed by syringing.

An abscess in the ear is very painful, and must be treated with warm fomentations, early incision, together with constitutional remedies.

CHAPTER LIII

DISEASES OF THE SKIN

ERYTHEMA—*Two forms recognised*—1. *Erythema simplex*—2. *Erythema nodosum*—*Use of tonics and quinine.*—CHILBLAINS—*Use of nitrate of silver.*—URTICARIA—*Use of quinine and arsenic in recurring chronic attacks.*—ROSEOLA—*Some of its forms are only varieties of urticaria*—*Change of air, mild tonics, and sea bathing are serviceable.*—LICHEN—*Value of arsenic in chronic cases.*—PSORIASIS—*Use of arsenic in.*—ECZEMA *divided into two forms*—1. *Acute*—2. *Chronic*—*Treatment of both forms.*—HERPES, *two forms*—1. *Herpes labialis*—2. *Herpes zoster.*—ECTHYMA.—IMPETIGO.—LUPUS VULGARIS—*Rarely seen under two years of age.*—DISEASES OF THE SCALP—1. *Alopecia areata, or tinea decalvans*—2. *Tinea tonsurans, or common ringworm*—*Scabies*—*Phthiriasis.*

THE skin is supplied with blood-vessels, nerves, and glands, and it performs a most important part as an exhalant surface. It is the common seat of touch and sensation, and it has direct relation with the internal organs.

The skin is much more susceptible in some persons than it is in others, and readily takes on morbid action. Its diseases are numerous and variable, some being inflammatory, as erythema, erysipelas, urticaria, &c., and others, being of a parasitic or contagious nature. Some are local and others are constitutional, each demanding a separate line of treatment. Diseases of the skin are of such frequent occurrence, and they come before the practitioner so constantly in daily practice that he ought to possess a fair knowledge of their pathology, diagnosis, and treatment.

The skin diseases of children should be looked at from a constitutional point of view, except in specific affections. They are mainly due to malnutrition, to errors of diet, to parasites, and to scratching. I propose to discuss only the most common types, leaving the more unusual ones for the specialist to deal with.

hood and adolescence, and each recurrence must be treated like the original attack. Symptoms of sudden feverishness and headache, denoting the possibility of intracranial inflammation, may come on at any stage, and require prompt surgical assistance. But this grave complication is very rare considering the great frequency of otorrhœa.

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and is very common in fat children. It is seen at the upper parts of the thighs, on their inner aspect, and between the nates. The parts at first become red, and then a serous, or sero-purulent, discharge takes place. In cold weather when the wind is keen, children often suffer from a chronic form of erythema, about the lips, nose, and corners of the mouth, caused by the saliva and nasal discharge. The surface is also cracked, rough and irritable.

Treatment.—In severe cases this consists in rest in bed, with such remedies as correct the general health. Tonics are valuable in Erythema nodosum, and quinine has in my experience acted as a specific. The treatment of *Erythema intertrigo* consists in the application of a little red lotion, or dusting the part with oxide of zinc and starch in equal proportions.

Chilblains consist of a localised erythema of the skin, chiefly affecting the hands and feet, as well as some other parts of the body most distant from the centre of the circulation; as the nose and lobes of the ear. Among children they are common in the winter season of the year when the weather is cold. The first action of cold is to produce a degree of numbness and insensibility of the affected part, a stiffness in motion, and more or less pallor from an impediment to circulation. When reaction is established, itching and tingling are experienced in the part, which soon becomes red, hot, and swollen. An abrupt line marks the limit of the inflammation. After the chilblain has continued a few days, the redness is exchanged for a bluish or livid appearance in consequence of congestion, dilatation of the capillaries, and slowness of the circulation. A chilblain may, however, reach another stage.

Sir Erasmus Wilson has described three degrees of severity:

1. The *Erythematous chilblain.*
2. The *Vesicated chilblain.*
3. The *Gangrenous chilblain.*[*]

1. The *Erythematous chilblain* is that which has just been described.

2. The *vesicated* or broken chilblain may be a consequence of the former variety, or arise from a greater degree of cold. The itching, swelling, and congestion are greater, and the chilblain is of a dusky purplish tint. The cuticle is raised by effusion of serum beneath which forms a vesicle, and, when it bursts, the surface is

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[*] 'Diseases of the Skin,' 1863, p. 314.

livid or grey, exposing an ulcerated or sloughing surface. Such chilblains are very tender and painful, the child cannot walk, and if the weather be severe and the health impaired, they may last all the winter.

3. The *Gangrenous chilblain.* In this variety the surface of the skin is destroyed by the action of the cold, gangrene follows, and a slough separates. Sometimes the constitutional symptoms are severe, there is great prostration of strength, and, according to Sir Erasmus Wilson, the brain is particularly liable to be affected, and the complaint sometimes to end fatally.

Treatment.—For the ordinary *erythematous chilblain*, a mild stimulating liniment of camphor, ammonia, &c., will sometimes restore the circulation in the affected part, or one composed of soap liniment and tincture of cantharides. Sir Erasmus Wilson recommends a liniment composed of the white and yolk of two eggs, two ounces of spirits of turpentine, and two ounces of distilled vinegar, well shaken together.[*] I have never found any remedy so uniformly successful as painting the affected parts with a solution of nitrate silver (gr. x—xx ad ℥j) night and morning, and keeping them warm and protected from the air. The *vesicated* and *ulcerated* chilblains are to be treated according to their inflamed or indolent condition. If inflamed, water dressing will be of service or a lead lotion; if the sores are torpid, the benzoate of zinc ointment, calamine ointment, or the resin ointment, with or without spirits of turpentine will be demanded.

Urticaria, or nettle-rash, is so called from an appearance of the skin similar to that caused by the sting of the common nettle. Wheals form on the skin, accompanied by burning and stinging, and they rapidly disappear without desquamation. They may be round, oval, or irregular in shape, and pale red or dusky in colour. Urticaria often comes on after a meal, accompanied with symptoms of indigestion, weight and pain at the epigastrium, nausea or even vomiting, the eruption lasting a short time, and then disappearing to recur again after taking food. The disease is sometimes very chronic and obstinate. It may occur in the course of other diseases, febrile and non-febrile; during and after scarlatina, and occasionally in connection with other exanthemata, and whooping-cough.[†] The disease may be combined with erythema and prurigo.

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[*] Op. cit., p. 315.

[†] 'Handbook of Skin Diseases,' by Dr. Hillier, 1865, p. 51.

Causes.—The disease may arise from the stings of insects or fleas, from mental emotion, or fear, or anger, and from certain articles of diet, as shell-fish, lobsters, pork, mushrooms, cheese, &c. Worms in the intestinal canal are said to produce it.

Treatment.—When the disease is *acute,* and there is gastric disturbance, an emetic is the best remedy, followed by an aperient. The diet should consist of mutton, milk, bread, and fresh vegetables. Citrate of potash, bicarbonate of soda, and the carbonate of ammonia will be useful. In the *chronic* form the diet must be carefully attended to, and the general health looked after. Quinine and arsenic are of use in recurring attacks.

Roseola or rose-rash consists of red spots of eruption, and is frequently seen in infants and young children. It resembles an ordinary inflammation of the skin, a state of hyperæmia in which the capillaries are more or less distended. There is one form called *Roseola annulata* consisting of red rings with healthy skin between them; when seen in infants it is called *Roseola infantilis;* that which accompanies the premonitory fever of variola is called *Roseola variolosa,* and that following vaccination *Roseola vaccinia.* The disease resembles in some instances *measles,* and in others *scarlatina,* but unlike the former affection the spots are not elevated, and it is usually limited to one limb, or to the trunk of the body. It may disappear in a few hours or last several days. It is usually wanting in the bright scarlet hue of scarlatina, and the temperature is not elevated as in this affection. The rash taken alone is sometimes extremely suspicious, but the absence of fever should remove all doubt. The eruption is generally attended with itching. Many of the so-called roseolas are only varieties of urticaria.

The *causes* which give rise to the affection are disturbance of the digestive organs, especially in hot weather, drinking cold water when the body is heated, dentition, &c.

Treatment.—The digestive organs must be regulated by mild aperients and a simple diet. If the gums are inflamed and tender from the pressure of teeth, they should be lanced. Change of air, mild tonics, and sea bathing are serviceable.

Lichen is recognised by numerous small red papules occurring on any part of the body; but the back of the hands, the neck, and the trunk, are the most frequent sites. The affected parts itch intolerably, and at last the papules desquamate and the eruption vanishes.

In *Lichen urticatus* the papules are larger, inflamed, and prominent. They are like the bite of a gnat or bug, and the surface is apt to bleed if there is much scratching. The disease is said to be peculiar to children, and remarkable for its obstinacy.*

Treatment.—This consists in the administration of alkalies and aperients. For the relief of itching, and to soothe irritable parts, lotions of borax and hydrocyanic acid with glycerine; belladonna and hydrocyanic acid, or bicarbonate of soda and hydrocyanic acid, are recommended. When the disease becomes chronic, arsenic should be taken for some time.

Psoriasis or Lepra is not common before five years of age. It is characterised by small white spots which increase in size and then run together, forming white and scaly patches. These patches are nothing more than layers of epidermis. There are neither vesicles nor pustules. The parts below the patella and elbow are most liable to be attacked, and sometimes the nails. Two forms are described. 1. That unattended with itching. 2. That attended with itching, which is often called *Gouty Psoriasis*, and rarely met with in children.

The disease is said to be hereditary. It is often seen in delicate and cachectic young persons whose digestion is at fault; and it is exceedingly liable to recur from time to time. The disease is not unfrequently associated with constitutional debility, rickets, and struma.

Treatment.—Remedies both of an internal and external character are needed. A careful regulation of the diet, and attention to the bowels are in all cases demanded. After this, arsenic as in many other chronic diseases of the skin, is useful; it acts as a tonic and alterative. The constitutional effects of the remedy are well known, as quickness of the pulse, heat, and itching of the eyelids, dryness of the throat, and a silvery film on the tongue. Sickness and diarrhœa sometimes ensue, and when any of these effects are produced, the remedy should be discontinued at least for a time. Arsenic should be given after meals, either in plain water, tincture of bark, or some bitter infusion, made palateable by the addition of a little syrup. There are few remedies better borne by children than arsenic, and they will take it for weeks together without inconvenience. One minim of Fowler's solution may be given twice or three times a day to a child from one to two years of age, and the dose gradually increased to twice the quantity. In the case of infants at the breast, small doses of arsenic may be administered to the mother.* As to local treatment this is very important. The scales when abundant should be removed by friction with soft soap and water, after which Dr Liveing recommends the surface to be dressed with tar ointment,† and when the skin becomes dry it should be smeared with grease to keep it soft. A solution of salicylic acid in alcohol (1 in 16), when rubbed over the psoriasis patch, removes the scales in a few minutes, and then prepares the skin for further treatment.‡ When the joints are cracked and sore, the application of olive oil will be necessary, the limb being afterwards protected with flannel.

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* Wilson, 'On Diseases of the Skin,' 1863, p. 161.

Chrysophanic acid ointment (ʒj ad ℥j) is a useful local remedy, but has the drawback of being sometimes very irritating to the skin, and always staining both the skin and the clothes. When cured by this ointment the psoriasis quickly returns.

Eczema, which is one of the most common diseases of the skin, may be divided into:—1. Acute. 2. Chronic. The acute variety consists in an eruption of small and slightly elevated vesicles, situated on patches of inflamed skin, and attended with severe smarting and itching. It is not contagious, but in a pustular form, inoculable. The fluid contained in the vesicles becomes opaque and thick, then it is discharged and dries into a superficial yellowish scab. The skin immediately surrounding the affected parts becomes similarly involved, and vesicles form on it to follow the same series of changes. The discharge coming in contact with a scratch or sore may produce the disease.

According to the late Dr Tilbury Fox, vesicles are not always seen, but their formation shows the "full height of the disease eczema."§ There is an *erythematous* eczema, a *vesicular* eczema, a *squamous* eczema, and a *pustular* eczema. He says some eczemas are almost entirely local, being caused by local irritants, having scarcely any inflammatory action, and yielding to local remedies. Then there are other cases in which the local mischief is severe; there is a sensation of heat, itching, and burning, the subcutaneous tissue is implicated, and the discharge is copious and irritating to the parts around. "In a third class of cases, occurring in young and lymphatic children, there is very free and early formation of pus, out of proportion to the degree of inflammation, as compared with the last form of eczema, indicating a pyogenic habit of body well marked. There is also free crusting, and often distinct evidence of the scrofulous diathesis in the family history. Now, though these now and then run the one into the other—and there are no hard-and-fast boundary lines in medicine—yet, on the whole, the distinctions are clear, and the terms simplex, rubrum, and impetiginodes, accurately portray these clinical varieties."*

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* 'Notes on the Treatment of Skin Diseases,' by R. Liveing, M.D., 1875, p. 61.

† Form. 99:

℞ Picis Liquidæ
Vel olei rusci ℥ss
Glycerini amyli ℥ij. M.

‡ 'The American Practitioner,' Feb., 1880, p. 115.

§ 'Eczema: its Nature and Treatment,' 1870, p. 12.

Children who are subject to eczema are generally pale, thin, and imperfectly nourished; the skin is dry and irritable, and the nervous system is wanting in tone. There is also an element of debility about them. In 1872, I had a very obstinate case of subacute bronchitis under my care, associated with chronic eczema, in a child twenty-one months old. The child, who presented a strumous aspect, had all her teeth but two; the lips were thick and bloodless, and the face, back of hands, and the flexures of the joints were covered with an irritating eruption. Under careful medical and hygienic treatment the child eventually recovered, though for some time after, exposure to cold brought on the eruption, and renewed the bronchitis. About the same time I saw a delicate boy, aged eight, who had subacute eczema and bronchitis of a tedious character. He was treated carefully for two years, and then made a good recovery.

The treatment of acute eczema consists in the observance of rest and quiet. As articles of diet, milk and water, farinaceous food, eggs, &c., should be prescribed. Stimulating food and spirits should be avoided. In the shape of medicines, sulphate of magnesia, with a few grains of nitrate of potash may be needed (Form. 8). A powder of scammony with calomel, or a little of the latter with the compound liquorice powder may be useful as an active purgative. Cold-water dressings, or the lotio plumbi are the best applications when there is heat and inflammation. They should be changed as often as they become dry. If there is great tingling of the skin, alkaline lotions, or the decoction of poppy heads may be necessary. It must be borne in mind that ointments are most useful in the scaly, and lotions in the discharging stage. Fluid applications are, however, sometimes difficult of employment in young children, and then under these circumstances, Dr R. Liveing recommends that the skin be powdered with equal parts of oxide of zinc and starch, to which a few grains of powdered camphor are added.[*] In some cases linseed-meal poultices should be afterwards applied. When the eruption is very irritable, covering the parts affected with benzoated zinc ointment, and sleeping in an old linen shirt are advisable. The ung. plumbi applied on rag, and kept on by a bandage is very serviceable; it was highly recommended by the late Dr Tilbury Fox. Calamine and oxide of zinc form a good lotion in acute eczema[†] In regard to constitutional remedies, aperients and alkalies may be required whilst the stage of excitement lasts. Later on, the mineral acids, with a bitter, are serviceable (Form. 14—20). Arsenic, too, with or without the vinum ferri is useful (Form. 93).

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* Op. cit., p. 20.

Chronic eczema is sometimes a consequence of the acute variety. The skin is roughened and in a state of chronic inflammation; whilst at the bends of the joints there are cracks and fissures with silvery shining crusts upon them. The skin is very irritable and smarting; if the eruption be situated near the vulva or anus, the itching is distressing, and patients cannot prevent scratching themselves when warm in bed at night. The disease may continue for months and years. I have seen a few obstinate cases in young children not exceeding seven years of age, in whom the paternal parents, and their ancestors for two or three generations, were gouty, and some of them had suffered from eczema.

Treatment.—Coffee and stimulants should be avoided, and the diet should be light and nutritious. The bowels should be regulated by gentle aperients, and all sources of irritation, as worms, be removed. Arsenic alone, or in combination with iron, will be found most serviceable (Form. 93). Cod-liver oil, malt extract, &c., may be given to weakly and strumous children. To remove the crusts which collect on the head they should be well moistened with oil, and then a poultice of bread and water applied afterwards. Later on, the ung. hyd. cum plumbo, or diluted nitric oxide of mercury ointment with creasote, will be beneficial. The unguentum plumbi acetatis in the proportion of one or two drachms to an ounce of glycerine is an excellent application, or a few drops to a drachm of the liquor plumbi subacetatis may be advantageously mixed with an ounce of glycerine.

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[*] Form. 100:
℞ Zinci Oxyd.
Pulv. Amyli āā ʒij
— Camphoræ gr. v
M. To form a powder.

[†] Form. 101:
℞ Pulv. Calam.
Zinci Oxyd. āā ʒij
Liq. Calcis ℥ss
Glycerini ʒij
Aquæ Rosæ ad ℥vj.
M. Fiat Lotio.

Obstinate and chronic as this disease is, it is generally curable if the treatment adopted be judicious, carried out regularly, and for a sufficient length of time. Each stage must be watched carefully, and the treatment varied according as it is inflammatory, vesicular, or squamous; in one stage the skin is too active, in the other it requires to be roused into activity and energy. Constipation, dyspepsia, hepatic disorder, renal inadequacy, and general debility, have all to be considered in carrying out the treatment.

Herpes, or Tetter, consists of a cluster of globular vesicles situated on an inflamed base, the contents of which soon change from a clear to a milky fluid, and then dry up, leaving a brown scab. Two kinds are generally described:

1. Herpes labialis.
2. Herpes zoster.

1. *Herpes labialis* is usually seen in catarrh, and in pulmonary affections. It may last two or three weeks, and is unattended with any constitutional disorder.

2. *Herpes zoster* is almost unknown in infants at the breast. It is rare under five years of age. It is characterised by the vesicles encircling one half of the body, and being attended with intense heat and itching. In two children who came under my notice, twelve and fourteen years of age, severe neuralgia followed in the track of the eruption after it had healed.

The *treatment* consists in the use of mild aperients, warm baths, and plain diet. Lead lotion, and the ung. zinci benz. are both serviceable for the relief of pain and local irritation.

Ecthyma is a disease in which large pustules form situated on an inflamed portion of the skin. They break and dry into thick scabs, and when they fall off there is ulceration beneath. When this has healed the neighbouring skin is of a purplish tint. The disease is seen in strumous and badly nourished children, and it is an occasional sequela of scarlatina and measles. It may be *acute* or *chronic*. The acute form of the affection is attended with slight febrile disturbance, headache, loss of appetite, heat, and itching. It may last two or three weeks. Tartar emetic ointment produces a similar eruption. The chronic form is often seen in delicate infants and young children. There is no fever and no pain. The pustules are very large, and successive crops may spring up, and continue for two or three months.

Treatment.—The scabs should be removed by poulticing, or moistening with warm oil. The ulcers should be dressed with lead lotion, or water dressing if inflamed, and if indolent with the nitric oxide of mercury ointment, or some similar application. Good food, cod-liver oil, mild aperients, will be needed. The mineral acids and bark, the vinum ferri and arsenic (Form. 93), are also serviceable.

Impetigo.—This disease is more common than that which has just been described (ecthyma). In most cases these are forms of pustular eczema. The disease consists in the appearance of small pustules, which come to maturity in the course of a day or two. They then burst and discharge thick pus, which becomes transformed into a brownish yellow scab. Pus often continues to ooze from under the scab or crust, and when the scab finally separates, a red mark is left.

Impetigo may be seen on the arms, legs, face, or scalp. When it attacks the face of children it is known as *crusta lactea.*[*]

The disease is generally due to debility, and is of frequent occurrence in children. Pediculi of the head by causing irritation may excite it.

Treatment.—The diet should be plain, simple, and nutritious, all stimulants being avoided. Aperients, followed by tonics, as quinine, will be serviceable, and if the disease threatens to become chronic, iodide of potassium with bark will be necessary, and baths to improve the state of the skin. Locally, poultices to remove crusts will be required, and the sores should be dressed with dilute citrine ointment, or the white precipitate ointment.

Lupus vulgaris is a chronic disease of the skin, non-contagious, and, though common in early life, is said to be rarely seen in children under two years of age. It usually attacks the face, and more particularly the nose, but it may occur on any part of the body. It begins with small reddish tubercles, which increase in size, and then ulcerate. The disease is associated with the strumous diathesis. It may be mistaken for syphilis, and in older persons it has been confounded with cancer.

Treatment.—This consists primarily in constitutional measures, fresh air, animal food, and a liberal diet, of which milk should form a chief part. In respect to medicines, cod-liver oil is most essential, and iron and arsenic are valuable remedies. The local treatment consists in the application of some caustic, as the acid nitrate of mercury.

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[*] Hillier, op. cit., p. 163.

Favus (*Tinea favosa*) is a very chronic and contagious disease. It is rare in England, but more frequent in Scotland and abroad. It is commonly observed on the heads of children who are scrofulous and badly fed. Examined microscopically the favi are seen to consist of a fungus (*Achorion Schoenleinii*) which in its growth irritates the scalp, and affects the hair follicles. When seen in an early stage there are small, circular, and concave crusts, of a sulphur colour, which coalesce, and form into yellow masses of a honeycomb appearance. On removal, a moist red or ulcerated surface remains behind.

The *treatment* consists in moistening the crusts of fungus with carbolic oil, and then poulticing till they are removed. The hair is to be cut short, and the hairs carefully pulled out with forceps from the affected parts. To destroy the parasite strong sulphurous acid, in an equal quantity of water, or a lotion of perchloride of mercury (gr. iv ad ℥vj) should be rubbed in to the diseased surface. Afterwards the iodide of sulphur ointment, or the oleate of mercury ointment, may be found useful. The general health requires to be put in good order, by nourishing food, iron, quinine, and cod-liver oil.

Alopecia areata (tinea decalvans) is a common disease in childhood, of a non-parasitic nature. It consists in an atrophied state of the roots of the hair, which terminates in baldness. The hair first becomes dry, and then withers and falls off, leaving white and smooth circular patches, spreading at the circumference. Sometimes the entire scalp becomes bald.

As to the pathology of the affection, a fungus was formerly believed to be developed within the follicles of the roots of the hair, and then spread to the cuticle. This view is now rejected by most competent observers.

Treatment.—This is very unsatisfactory; but painting the parts affected with tincture of iodine once or twice a day, or occasionally blistering with the fluid blister of the Pharmacopœia, often brings about a cure. Dr Hillier recommended rubbing the bald parts with a liniment composed of equal parts of tincture of cantharides and olive oil. Strong carbolic acid is an excellent application when the patches are small, but it requires care. Tincture of iodine or iodine liniment are also useful. Steiner recommends Rindfleisch's mixture of glycerine and tincture of capsicum.[*] Iron and arsenic internally, and good living are all important.

Tinea tonsurans—porrigo scutulata (ringworm of the scalp) is a contagious and obstinate disease, and spreads rapidly in families and schools. Its origin depends upon a fungus (tricophyton tonsurans) with oval or rounded spores. The roots of the hair become mouldy, and at last break away near the surface of the skin. The hairs are brittle and thickened, readily breaking at the roots, which present a split and ragged appearance. Dry, scaly, and circular patches form, varying from half an inch to three or four inches in diameter. Vesicles are also sometimes seen, as in eczema, and a viscid fluid escapes from the follicles.

The ringworm (tinea carcinata) seen on the face, neck, and arms, as a spreading scurfy ring, is due to the same fungus, and the disease often coexists with tinea tonsurans. It may give rise to the latter by extension from the surface of the body to the hairy scalp.

Treatment.—The same as that recommended for the previous disease in an early stage. Later on, if it does not yield, a fairly strong citrine ointment, used night and morning, will cure most cases. Carbolic acid, or the carbolised glycerine of the Pharmacopœia, is useful. The hair round the patch is to be cut short, and the head washed night and morning with carbolic soap. Afterwards a lotion of hyposulphite of soda may be applied (ʒj ad ℥j). Mr Alder Smith[†] recommends an ointment of nitrate of mercury, carbolic acid, and sulphur in equal proportions for a child ten years of age, and for younger children equal parts of citrine ointment and carbolic acid, with three or four of sulphur ointment. When the disease is chronic the oleate of mercury is one of the best remedies, well applied to the patches night and morning. The hair is to be cut short, and the treatment perseveringly employed for some months. To promote the regrowth of the hair Dr Tilbury Fox recommended the following wash to be well sponged into the roots of the hair night and morning:—Tincture of lytta 6 drachms, distilled vinegar 2 ounces, spirit of rosemary 2 ounces, glycerine 2 drachms, 6 ounces of rose water.[‡]

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[*] Op. cit., p. 395.

[†] 'Ringworm; its Diagnosis and Treatment.'

[‡] Quain's 'Med. Dictionary,' 1883, p. 1635.

Tinea carcinata generally yields to the application of carbolic acid, tincture of iodine, or glacial acetic acid. In very obstinate cases the hyposulphite of soda lotion should be freely applied, or goa powder made into a soft paste with vinegar, or an ointment with benzoate of lard.

Preventive measures are of the utmost importance that the disease may not spread in a family or school when it breaks out. If possible the infected child should be isolated. The combs, brushes, towels, &c., of the infected must not be used by healthy children. The same rule applies to caps and coats. Linen should be well washed and boiled. Each spot should be vigorously attacked on its appearance, and the head washed with carbolic soap twice or three times a week. The healthy children should have a pomade applied, consisting of the red oxide of mercury and white precipitate ointment, scented with some aromatic oil.

Scabies, psora or itch, is a contagious disease arising from the acarus scabiei (itch mite) burrowing beneath the cuticle, and there depositing its eggs. It may be seen in this situation as a small body, the skin presenting at the point of entrance a papular elevation. The spot resembles an old pin scratch, with ragged dirty edges, and is usually seen between the fingers and toes, at the bend of the elbow, the axilla, and behind the knee; but it may attack any part of the body, especially in children. When the vesicle is broken, scabs or crusts are formed. In these crusts young animals are contained. The irritation may occasion various forms of eczema and urticaria, especially in long-standing cases. The scratching is worse at night when the children are warm in bed.

Treatment.—The child should have a warm bath before going to bed, and be washed with soap and flannel. After being well dried he should have the sulphur and potash ointment* rubbed into him. He should then be clothed with flannel, and wear gloves and socks to prevent the application from rubbing off. The next night the process should be repeated, and it may be necessary to repeat it for a third night. A sulphur bath is also an excellent remedy, and may obviate the use of the ointment altogether.

Phthiriasis—lousiness.—This disease arises from lice being situated on the body. The most common sites are—

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* Ung. Potass. Sulph., B.P.

1. The head (*Pediculus capitis*).
2. The body (*Pediculus corporis*).
3. The pubis (*Pediculus pubis*).

The eggs, which are known as nits, bite the skin, and produce a pustular eruption and insufferable itching.

The *treatment*, which is always effectual, consists in rubbing in mercurial ointment or the white precipitate ointment. A few applications generally suffice for a cure. For *Pediculi corporis*, staphisagra ointment (Squire's formula) is the best and safest.

FORMULÆ

FORM. PAGE

Saline Aperient . . . . . . 1 ... 19

℞ Magnes. Sulph. ʒj
Tinct. Rhei ℥ss
Vel Syr. Rhei ℥ss
— Zingib. ʒij
Tinct. Cinnamomi ʒj
Aquam Anethi ad ℥ij. M.

One to two teaspoonfuls to be taken at bedtime and in the early morning.

For children from six to twelve months old.

In vomiting and flatulence . . . . 2 ... 33

℞ Acid. Hydrocy. Dil. ♏vj
Spt. Amm. Arom. ♏xx
Syrupi — ℥ss
Liquor. Magn. Carb. ad ℥iss. M.

A teaspoonful to be taken every four hours.

For children a year old.

Sedative in cerebral irritation . . . . 3 ... 33

℞ Potass. Bromid. gr. xx
— Iodidi gr. iij
Spt. Amm. Arom. ♏xx
Syrupi — ʒiij
Aquam ad ℥iss. M.

A teaspoonful to be taken every four hours.

For children a year old.

FORM. PAGE

Astringent . . . . 4 ... 58

℞ Tinct. Krameriæ ʒiij
Liquor. Opii Sed. ♏xij
Spt. Chloroform. ♏xx
Syr. Zingiberis ℥ss
Aquam ad ℥iv. M.

A dessert-spoonful after each action of the bowels.

For children from five to eight years of age.

In typhoid fever . . . . 5 ... 59

℞ Acid. Hydrochl. Dil. ♏xl
Spt. Chloroform. ♏xx
Syr. Rosæ ℥ss
Aquam ad ℥iv. M.

A dessert-spoonful every four hours.

For children from five to eight years of age.

Tonic in some states of typhoid fever . . . 6 ... 59

℞ Quinæ Sulph. gr. iv
Acid. Phosph. Dil. ʒj
Syrupi ℥ss
Aquam ad ℥iv. M.

A dessert-spoonful three or four times a day.

For children from five to eight years of age.

In some febrile states . . . . . . 7 ... 72

℞ Liquor. Amm. Acet. ℥ss
Vin. Antimonialis ♏xl
Syr. Tolutani ʒiij
Aquam ad ℥iv. M.

A tablespoonful every four hours.

For a child five or six years old.

Saline aperient . . . . 8 ... 73

℞ Magnes. Sulph. ʒj
Potass. Nitrat. ʒss
Syr. Limonum
Vel Syr. Tolut. ʒiij
Aquam ad ℥iv. M.

A tablespoonful every four hours.

For a child five or six years old.

FORM. PAGE

In scarlatina . . . . 9 ... 74

℞ Potass. Chlorat. gr. xx
Acid. Hydrochl. Dil. ♏xl
Syr. Hemidesmi ℥ss
Aquam ad ℥iv. M.
A tablespoonful three times a day.
For a child five years old.

Solution for the throat . . . . . 10 ... 94

℞ Liq. Ferri Perchlor. ʒj
Glycerini
Aquæ āā ℥ss. M.
Fiat Solutio.—To be applied in scarlet fever and diphtheria.

Tonic . . . . 11 ... 96

℞ Amm. Carb. gr. viij
Tinct. Cinch. Comp. ʒij
Syr. Aurant. ʒiij
Aquam ad ℥iv. M.
A dessert or tablespoonful every four hours.
For a child four or five years old.

Saline . . . . 12 ... 108

℞ Liquor. Amm. Acet. ℥ss
Spt. Æther. Nitr. ʒj
Syr. Rosæ ʒiij
Aquam ad ℥iv. M.
A tablespoonful every four hours.
For children five years of age.

Saline . . . . 13 ... 108

℞ Amm. Carb. gr. viij
Liquor. Amm. Acet.
Syr. Aurant. āā ℥ss
Aquam ad ℥iv. M.
A tablespoonful every four hours.
For children five years of age.

FORM. PAGE

Tonic . . . . 14 ... 109

℞ Acid. Nitric. Dil.
— Hydrochl. Dil. āā ʒss
Tinct. Cinch. Co.
Vel — Calumbæ ʒiij
Syrupi ℥ss
Aquam ad ℥iv. M.
A tablespoonful three times a day.
For children five years of age.

Astringent . . . . 15 ... 110

℞ Tinct. Krameriæ ʒij
— Opii ♏xij
Spt. Chloroform. ♏xvj
Syr. Zingib. ʒiij
Aquam ad ℥iv.
M. A tablespoonful after each action of the bowels.
For a child five years of age.

Astringent . . . . 16 ... 110

℞ Pulv. Cretæ c. Opio ℈ij
Tinct. Catechu ʒij
Aquam. Menth. Pip. ad ℥ij. M.
Two teaspoonfuls after each action of the bowels.
For children five years of age.

In ophthalmia from smallpox . . . . 17 ... 111

℞ Zinci Sulph. gr. ij
Vini Opii ♏xx
Aquam Rosæ ad ℥j. M.
Fiat Collyrium.

In ophthalmia from smallpox . . . . 18 ... 111

℞ Sodæ Biborat. gr. xij
Zinci Sulph. gr. j
Aquæ Camph. ʒj
Aquam destil. ad ℥j. M.
Fiat Collyrium.

FORM. PAGE

In Indigestion . . . . 19 ... 135

℞ Sodæ Bicarb. gr. xij
Spt. Amm. Arom. ♏xij
Syr. Rhei
Vel Succi Taraxaci ʒiij
Tinct. Calumbæ ʒj
Aquam Anethi ad ℥iss. M.
ʒij ter die.
For children a year old.

Tonic . . . . 20 ... 135

℞ Acid. Nit. Dil. ♏xij
— Hydroch. Dil. ♏xxiv
Tinct. Calumbæ ʒj
Syr. Aurant. ʒij
Aquam ad ℥ij. M.
ʒj ter die.
For children a year old.

In sickness and dyspepsia . . . . . 21 ... 135

℞ Acid. Hydrocy. Dil. ♏xij
— Nitric Dil. ♏xx
Syrupi ʒij
Aquam ad ℥iss. M.
ʒj ter die.

Tonic . . . . 22 ... 135

℞ Tinct. Cinch. Co. ʒiss
— Nucis Vom. ♏xij
Syrupi ʒij
Aquam ad ℥iss. M.
ʒj ter die.
For children a year old.

Laxative in constipation and irritable diarrhœa . . 23 ... 147

℞ Ol. Ricini ℥ss
Magnes. Carb. ʒij
Sacchari ʒiij
Ol. Anisi ♏ij. M.
A teaspoonful for a dose.

FORM. PAGE

In some forms of diarrhœa . . . . 24 ... 147

℞ Ol. Ricini ℥ss
T. Opii ♏vj
Mucilag. ʒij
Syr. Zingib. ʒiij
Aquam Anethi ad ℥iss. M.
One teaspoonful to be given occasionally.
For children from six to twelve months old.

In diarrhœa . . . . . . 25 ... 147

℞ Sodæ Bicarb. gr. xij
Liq. Bismuth. ʒij
Mucilag. ʒij
Syr. Zingib. ℥ss
Liq. Magnes. Carb. ℥iv. M.
A dessert-spoonful three times a day.
For a child two years old.

Carminative and aperient . . . . . 26 ... 149

℞ Pulv. Rhei
Sodæ Bicarb. āā gr. xij
Spt. Amm. Arom. ♏xx
Syr. Zingib. ʒiij
Aquam Menth. Pip. ad ℥iss. M.
A teaspoonful every four hours.
For children a year old.

In some forms of diarrhœa . . . . 27 ... 149

℞ Magn. Sulph. ʒss
Tinct. Rhei ʒj
Vel Syr. Rhei ʒij
Tinct. Quiniæ ʒss
Aquam Menth. Pip. ad ℥iss. M.
A teaspoonful every four hours.
For children from one to two years old.

FORM. PAGE

Astringent . . . . 28 ... 153

℞ Acid. Gallic. gr. viij
Tinct. Cinnamomi ʒj
— Opii ♏iv
Syrupi ʒij
Aquæ Cinnamomi ʒv
Aquam ad ℥ij. M.

Two teaspoonfuls every four hours.

For children of a year old.

Astringent . . . . 29 ... 153

℞ Plumbi Acetat. gr. vj
Aceti ♏xx
Tinct. Opii ♏viij
Mucilag. Acaciæ ʒij
Syr. Zingib. ʒj
Aquam. ad ℥ij. M.

Two teaspoonfuls every six hours.

For children of a year old.

Astringent[*] . . . . 30 ... 153

℞ Tinct. Opii ♏vj
— Card. Co. ʒj
Syrupi ʒij
Decoct. Hæmatoxyli ad ℥iss. M.

A teaspoonful every four hours.

For children of a year old.

Astringent . . . . 31 ... 153

℞ Tinct. Catechu ʒj
Syr. Zingib. ʒij
Mist. Cretæ ad ℥iss. M.

A teaspoonful every four hours.

For children of a year old.

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[*] As children are particularly susceptible to the action of opium, it is necessary to watch the effects of the drug, and to remember the fact that the liquid preparations become concentrated by keeping.

FORM. PAGE

Astringent . . . . 32 ... 153

℞ Tinct. Krameriæ ʒij
— Opii ♏vj
Spt. Chloroform. ♏xx
Pulv. Acaciæ ʒss
Aquam ad ℥iss. M.
A teaspoonful every four hours.

Astringent . . . . 33 ... 153

℞ Acid. Nitric. Dil. ♏xxiv
Tinct. Camph. Co. ʒj
Spt. Chloroform. ♏xij
Syr. Zingib. ʒij
Decoct. Hæmatoxyli ad ℥iss. M.
A teaspoonful every four hours.
For children of a year old.

Astringent . . . . 34 .. 153

℞ Acid. Sulph. Dil. ʒss
Spt. Chloroform. ♏xx
Syrupi ʒij
Aquam ad ℥iss. M.
A teaspoonful every four hours.
For children of a year old.

Astringent . . . . 35 ... 153

℞ Acid. Nitric. Dil. ♏xx
Syr. Gummi Rubr. ʒij
Spt. Chloroform. ♏xx
Decoct. Hæmatoxyli ad ℥iss. M.
A teaspoonful every four hours.
For children of a year old.

Astringent . . . . 36 ... 153

℞ Ext. Belæ Liquid. ℥ss
Syr. Gummi Rubr. ʒij
Tinct. Camph. Co. ʒj
Syr. Zingib. ʒij
Aquam ad ℥iss. M.
A teaspoonful three or four times a day.
For children six years of age.

FORM. PAGE

Astringent . . . . 37 ... 153

℞ Cupri Sulph. gr. ij
Liq. Opii Sed. ♏xxiv
Spt. Chloroform. ʒj
Aquam Cinnamomi ad ℥iij. M.
Two teaspoonfuls three times a day.
For children six years of age.

In ascarides . . . . . . 38 ... 155

℞ Ferri Sulphat. ʒj
Inf. Quassiæ ℥viij. M. Fiat enema.
A fourth part to be used every morning.

Laxative . . . . 39 ... 164

℞ Mannæ Opt. ʒij
Aquam Anethi ℥j. M.
A teaspoonful once in two or three hours till the bowels act.
For children from four to six months old.

Laxative . . . . 40 ... 164

℞ Potass. Bitart. ʒss
Mannæ ℥ss
Aquam Anethi ad ℥iss. M.
About gr. x or gr. xv for a dose, to be repeated occasionally.
For children from four to six months old.

Saline aperient . . . . . . 41 ... 165

℞ Magnes. Sulph. ʒiss
Syr. Rhei ℥ss
Tinct. Cinnamomi ʒss
Liq. Magnes. Carb. ad ℥iss. M.
One or two teaspoonfuls occasionally.
For children from six to twelve months old.

Alterative and tonic in sluggish liver . . . 42 ... 165

℞ Acid. Nitric. Dil. ♏xvj
— Hydrochl. Dil. ʒss
Succi Taraxaci ʒj
Syrupi ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.
For a child three or four years old.

FORM. PAGE

Carminative in flatulence . . . . . 43 ... 167

℞ Potass. Bicarb. gr. viij
Ol. Cajeputi ♏iv
Aquæ Anethi ℥j. M.
A teaspoonful three times a day.

In congestion of the liver . . . . . 44 ... 198

℞ Acid. Nit. Dil. ℥j
Aquam Rosæ ad ℥xx.
Fiat Lotio. Two folds of linen rag to be saturated with a little of this lotion, and applied to the region of the liver, under oil-silk.

Sedative in cystitis . . . . . 45 ... 252

℞ Liquor. Potass. ʒj
— Opii Sed. ♏viij
Mucilag. ℥ss
Mist. Camph. ad ℥iv. M.
A tablespoonful every four hours.
For a child of eight or ten years old.

In ascites . . . . 45A ... 269

℞ Elaterii gr. ½
Spt. Æther. Nitr. ʒj
Tinct. Hyoscyami ʒss
Syr. Zingib. ʒij
Aquam ad ℥iv. M.
Two teaspoonfuls in an equal quantity of water for a dose.

In ascarides . . . . . . 46 ... 273

℞ Sodii Chlorid.
Vel Ferri Sulph. ʒj
Inf. Quassiæ Oj.
Fiat enema.
A third part to be used every morning.

In ascarides . . . . . . 47 ... 273

℞ Liquor Calcis ℥vj.
Fiat enema.
To be used every morning.

FORM. PAGE

In round-worm . . . . 48 ... 275

℞ Santonin gr. iv—vj
Sacchari gr. ij.
Fiat pulvis.
To be taken every third night.

In round-worm . . . . 49 ... 275

℞ Santonin gr. ij
Pulv. Scammonii co. gr. v.
Fiat pulvis.
To be taken at bed-time.

In round-worm . . . . 50 ... 276

℞ Santonin gr. xv
Pulv. Zingib. gr. v
Pulv. Jalapæ ʒss
Sulphuris loti ʒiss
Conf. Sennæ ℥j. M.
ʒj three times a day.

In tapeworm . . . . 51 ... 277

℞ Ext. Filicis Liquid. ʒss—ʒj
Syr. Zingib. ʒj
Pulv. Acaciæ gr. x
Aquam Cinnamomi ad ℥j. M.
Fiat haustus.
For a child from five to ten years old.

In Ozæna . . . . 51A ... 285

℞ Sodæ Bicarb.
— Biborat. āā ʒij
Liq. Sodæ Chlor. ʒss—ʒij
Glycerini ℥j
Aquam ad ℥viij.
M. Fiat lotio.
To be injected up the nostrils.

Saline . . . . 52 ... 320

℞ Liq. Amm. Acet. ʒij
Sp. Æther. Nitr. ʒ
Syr. Rosæ ʒiij
Aquam ad ℥iv. M.
A tablespoonful to be taken every four hours.

FORM. PAGE

Tonic . . . . 53 ... 320

℞ Tinct. Ferri Perchlor. ʒj
Glycerini ℥ss
Aquam ad ℥iv. M.
A tablespoonful every four hours.
For children five years of age.

Tonic . . . . 54 ... 320

℞ Tinct. Ferri Perchl. ♏xl
Potass. Chlorat. gr. xl.
Acid. Hydrochl. dil. ♏xl
Syrupi — ℥ss
Aquam ad ℥iv. M.
A tablespoonful every four hours.
For children five years of age.

Solution for the throat . . . . . 55 ... 321

℞ Potass. Chlorat.
Boracis āā ʒj
Glycerini
Mellis āā ℥ss. M.
The throat to be mopped out with a little of this solution frequently during the day, in diphtheria.

Sedative in laryngismus . . . . . 56 ... 333

℞ Potass. Bromid. ʒj
Tinct. Quiniæ ʒiss
Glycerini ʒij
Aquam ad ℥iij. M.
A teaspoonful three times a day.
For a child one year old.

In whooping-cough . . . . . 56A... 345

℞ Atropiæ Sulph. gr. ¼
Sacch. alb. ʒij. M.
A grain and a half three times a day.

FORM. PAGE

In whooping-cough . . . . . 56B... 345

℞ Atropiæ Sulph. gr. $\frac{1}{120}$
Vini Ipecac. ♏v
Potass. Bicarb. gr. vj
— Nitrat. gr. iv
Syr. Tolut. ʒss
Aquam ad ʒij. M.
To be taken three times a day.

In whooping-cough . . . . . 56C... 345

℞ Atropiæ Sulph. gr. $\frac{1}{120}$
Acid. Nit. Dil. ♏iij
Syr. Tolut. ʒss
Aquam ad ʒij. M.
To be taken three times a day.

Sedative in whooping-cough . . . . 57 ... 347

℞ Ext. Belladonnæ gr. j
Aluminis ʒss
Syr. Zingib.
— Acaciæ
Aquæ āā ℥j. M.
ʒj four times in the twenty-four hours.
For a child a year old. (Meigs and Pepper.)

In whooping-cough . . . . . 58 ... 348

℞ Cocci gr. v
Potass. Bicarb. gr. xl
Syrupi ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful every three or four hours.
For a child two years old.

Sedative and tonic in whooping-cough . . . 59 ... 350

℞ Tinct. Quiniæ ʒij
Potass. Bromid. gr. xl
Glycerini ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.
For a child five years old.

FORM. PAGE

In some forms of bronchitis and catarrh . . 60 ... 392

℞ Liquor. Amm. Acet. ℥ss
Acid. Hydrocy. Dil. ♏viij
Vin. Antimonialis ♏xl
Syr. Scillæ ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful every four hours.
For a child five or six years old.

In bronchitis . . . . . . 61 ... 392

℞ Amm. Carb. gr. iv
Spt. Chloroform. ♏xx
Syr. Tolut. ℥ss
Aquam ad ℥ij. M.
A teaspoonful every four hours.
For a child a year old.

Saline depressant in febrile states . . . 62 ... 393

℞ Hydr. Chlorid. gr. ij
Pulv. Antimonialis gr. viij
Potass. Nitrat.
Sacchari āā gr. xij. M.
Et divide in pulveres iv.
One every four or six hours.
For a child from five to ten years old.

In catarrh and bronchitis . . . . . 63 ... 393

℞ Syr. Tolut.
— Scillæ
Aquam āā ℥ss. M.
A teaspoonful when the cough is troublesome.

In catarrh and bronchitis . . . . . 64 ... 393

℞ Syr. Tolut.
— Scillæ
— Sennæ āā ℥ss. M.
A teaspoonful twice or three times a day, or when the cough is troublesome.

FORM. PAGE

In some forms of bronchitis . . . . 65 ... 393

℞ Potass. Citrat.
Vel — Bicarb. ʒss
T. Camph. Comp.
Vin. Ipecac. āā ʒj
Syr. Scillæ ℥ss
Aquam ad ℥ij. M.
A teaspoonful every three hours.
For children from one to two years of age.

In some forms of bronchitis . . . . 66 ... 394

℞ Vin. Ipecac.
Tinct. Scillæ āā ♏xl
— Conii ʒj
Spt. Æther. Nit. ʒj
Syr. Tolut. ℥ss
Decoct. Senegæ ad ℥iv. M.
A dessert-spoonful every four hours.

In chronic bronchitis . . . . . 67 ... 395

℞ Amm. Carb. gr. viij
Tinct. Cinch. Co. ʒij
Syr. Tolut. ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful three or four times a day.
For children five or six years old.

Tonic in some forms of catarrh . . . . 68 ... 395

℞ Syr. Ferri Iod. ℥ss
Vin. Ipecac. ʒj
Aquam ad ℥iij. M.
Two teaspoonfuls three times a day.
For children five or six years old.

Tonic in some forms of pneumonia . . . 69 ... 436

℞ Amm. Carb. gr. viij
Tinct. Quiniæ ʒiij
Spt. Chloroform. ♏xx
Syr. Tolut. ʒiij
Decoct. Senegæ ad ℥iv. M.
A tablespoonful every four hours.
For children five or six years old.

FORM. PAGE

Stimulating expectorant in pneumonia . . . 70 ... 436

℞ Amm. Carb. gr. viij
Potass. Bicarb. ℈ij
Vin. Ipecac. ♏xl
Syr. Tolut. ʒiij
Aquam ad ℥iv. M.
A tablespoonful every four hours.
For children five or six years old.

Stimulant in some forms of pneumonia . . . 71 ... 440

℞ Tinct. Cinch. Co. ʒiiss
Amm. Carb. gr. viij
Tinct. Camph. Co. ♏xl
Syr. Tolut. ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful every four hours.
For children five or six years old.

Stimulant and tonic in some forms of pneumonia . . 72 ... 441

℞ Ferri et Amm. Citr. gr. xij
Amm. Carb. gr. viij
Potass. Iodidi gr. iv
Syrupi ʒij
Aquam ad ℥iv. M.
A dessert-spoonful to be taken three times a day.
For children five or six years old.

Tonic in tuberculosis and phthisis . . . 73 ... 470

℞ Calcis Hypophosphitis ℈ij
Tinct. Ferri Perchl. ʒiss
Quiniæ Sulph. gr. vj
Liquor. Strychniæ ♏xx
Syrupi ℥j
Aquam ad ℥vj. M.
A tablespoonful three times a day.

In the cough of phthisis . . . . . 74 ... 500

℞ Syr. Papav.
— Scillæ
— Limonum āā ℥ss. M.
ʒj pro re nata.

FORM. PAGE

In the cough of phthisis . . . . . 75 ... 500

℞ Morph. Acet. gr. ¼
Acid. Hydrocy. Dil. ♏xvj
Glycerini ʒij
Aquam ad ℥iss. M.
ʒj pro re nata.
For children from five to ten years old.

In cough and laryngeal irritation . . . 76 ... 500

℞ Potass. Chlorat. ʒss
Liquor. Morph. Hydrochlor. ♏xx
Syr. Tolutani ʒvj
Aquam ad ℥ij. M.
ʒj pro re nata.
For children from five to ten years old.

Sedative to relieve cough . . . . . 77 ... 500

℞ Liquor. Morph. Hydrochlor. ♏xx
Vin. Ipecac. ʒj
Oxymellis Scillæ
Syr. Mori. āā ℥ss
Mist. Acaciæ ad ℥ij. M.
ʒj pro re nata.
For children from five to ten years old.

In incipient phthisis . . . . . 78 ... 502

℞ Sodæ Hypophosphitis ʒss
Syr. Aurant. ʒiij
Inf. Calumbæ ad ℥vj M.
A tablespoonful three times a day.

In incipient phthisis . . . . . 79 ... 502

℞ Sodæ Hypophosphitis ʒss
Syrupi ʒiij
Inf. Cinch. Flav. ad ℥vj. M.
A tablespoonful to be taken three times a day.

FORM. PAGE

Tonic in phthisis . . . . 80 ... 502

℞ Tinct. Ferri Perchl. ʒj
Calcis Hypophosphitis ʒss
Glycerini ʒiij
Aquam ad ℥vj. M.
A tablespoonful three times a day.

Tonic in phthisis . . . . 81 ... 502

℞ Sodæ Hypophosphitis ʒss
Acid. Phosp. Dil. ʒij
Tinct. Quiniæ
Glycerini āā ℥ss
Inf. Aurant. Co. ad ℥vj. M.
A tablespoonful three times a day, with one teaspoonful of cod-liver oil.
For children from ten years of age and upwards.

Tonic and sedative in epilepsy . . . . 82 ... 583

℞ Ferri et Amm. Citr. gr. xvj
Potass. Bromid. ℈ij
Syrupi ʒiij
Aquam ad ℥iv. M.
A tablespoonful three times a day.
For children from six to twelve years of age.

Tonic and sedative in epilepsy . . . . 83 ... 584

℞ Tinct. Digitalis, ♏xx—♏xl
Potass. Bromid. ℈ij
Syrup. Aurant. ʒiij
Aquam ad ℥iv. M.
A tablespoonful three times a day.
For children from six to twelve years of age.

Aperient . . . . 84 ... 622

℞ Potass. Sulphat. gr. x
Pulv. Rhei gr. iv. M.
To be taken in the early morning.
For a child ten years of age.

FORM. PAGE

In acute rheumatism . . . . . 85 ... 656

℞ Pulv. Ipecac. Co. gr. iij. M.
To be taken in water-arrowroot.

In acute rheumatism . . . . . 86 ... 656

℞ Potass. Bicarb. ʒij
— Nitrat ℈ij
Tinct. Opii ♏xvj
Syr. Limonum ℥ss
Aquam ad ℥iv. M.
A dessert-spoonful every three or four hours.
For a child six years of age.

In acute rheumatism . . . . . 87 ... 657

℞ Salicin ℈ij
Syr. Aurant. ℥ss
Aquam Cinnamomi ad ℥iv. M.
A dessert-spoonful to be taken every four hours.
For children six years of age.

Saline in acute rheumatism . . . . 88 ... 657

℞ Liq. Amm. Acet. ℥ss
Acid. Salicylic. ℈ij
Syr. Aurant. ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful every four hours.
For children six years of age.

Saline in acute rheumatism . . . . 89 ... 657

℞ Potass. Bicarb.
Acid. Salicylic. āā ℈ij
Syrupi ʒiij
Aquam Anethi ad ℥iv. M.
A dessert-spoonful every four hours.
For children six years of age.

In acute rheumatism . . . . . 90 ... 657

℞ Sodæ Salicylat. ℈ij
Syrupi ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful every four hours.
For children six years of age.

FORM. PAGE

In some forms of rheumatism . . . . 91 ... 659

℞ Potass. Bicarb. ʒj
Tinct. Cinch. co. ʒij
Syr. Zingib. ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.
For children from eight to twelve years of age.

In some forms of rheumatism . . . . 92 ... 659

℞ Potass. Bicarb. ʒj
Ferri et Amm. Citr. gr. xx
Syr. Aurant. ʒiij
Aquam Cinnamomi ad ℥iv. M.
A dessert-spoonful three times a day.
For children from eight to twelve years of age.

Tonic and alterative . . . . . 93 ... 674

℞ Vin. Ferri ℥iss
Syr. Tolut. ʒiij
Liq. Fowleri ʒj
Aquam ad ℥iv. M.
A teaspoonful in a tablespoonful of water twice a day after food.
For a child from five to ten years of age.

Tonic . . . . 94 ... 698

℞ Ferri Redacti
Sacchar. pur.
Pepsinæ Porci, āā gr. ij. M.
To be taken twice a day after food.
For children ten years of age.

Tonic . . . . 95 ... 699

℞ Ferri et Amm. Citr. gr. xvj
Amm. Carb. gr. viij
Syrupi ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.

FORM. PAGE

Tonic . . . . 96 ... 699

℞ Tinct. Ferri Perchlor. ♏xl
Glycerini ʒiij
Aquam Cinnamomi ad ℥iv. M.
A dessert-spoonful three times a day.
For children from five to ten years of age.

Aperient and tonic . . . . . 97 ... 700

℞ Magnes. Sulph. gr. xvj
Acid. Sulph. Dil. ♏iij
Ferri Sulph. gr. iv
Vel Tinct. Ferri Perch. ♏xl
Syr Zingib. ʒij
Aquam Carui ad ℥iv. M.
A dessert-spoonful three times a day.
For children from five to ten years of age.

Tonic . . . . 98 ... 700

℞ Tinct. Belladonnæ
— Ferri Perchlor. āā ♏xl
Spt. Chloroform ♏xvj
Glycerini ʒiij
Aquam ad ℥iv. M.
A dessert-spoonful three times a day.
For children from five to ten years of age.

In lepra . . . . 99 ... 722

℞ Picis Liquidæ
Vel Olei Rusci ℥ss
Glycerini Amyl. ℥ij. M.
For an ointment.

In eczema . . . . 100 ... 724

℞ Zinci Oxyd.
Pulv. Amyli āā ʒij
— Camphoræ gr. v. M.
To form a powder.

FORM. PAGE

In eczema . . . . 101 ... 724

℞ Pulv. Calam
Zinci Oxyd. āā ʒij
Liq. Calcis ℥ss
Glycerini ʒij
Aquam Rosæ ad ℥vj. M.

For a lotion.

BATHS.

Alkaline bath—

Carbonate of soda, one ounce.
Water (98° Fahr.), five gallons.

Sulphur bath—

Sulphurated potash, one ounce.
Water (98° Fahr.), seven gallons.

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